This document is scheduled to be published in the
Federal Register on 07/26/2022 and available online at
federalregister.gov/d/2022-15937, and on **govinfo.gov**

E 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648-XC070]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Office of Naval Research's Arctic Research Activities in the Beaufort and Chukchi Seas (Year 5)

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; proposed incidental harassment authorization; request for comments on proposed authorization and possible renewal.

SUMMARY: NMFS has received a request from Office of Naval Research (ONR) for authorization to take marine mammals incidental to Arctic Research Activities (ARA) in the Beaufort Sea and eastern Chukchi Sea. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to incidentally take marine mammals during the specified activities. NMFS is also requesting comments on a possible one-time, one-year renewal that could be issued under certain circumstances and if all requirements are met, as described in **Request for Public Comments** at the end of this notice. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorization and agency responses will be summarized in the final notice of our decision. The ONR's activities are considered military readiness activities pursuant to the MMPA, as amended by the National Defense Authorization Act for Fiscal Year 2004 (2004 NDAA).

DATES: Comments and information must be received no later than [*insert date 30 days after date of publication in the FEDERAL REGISTER*].

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service and should be submitted via email to *ITP.taylor@noaa.gov*.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments, including all attachments, must not exceed a 25-megabyte file size. All comments received are a part of the public record and will generally be posted online at *www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act* without change. All personal identifying information (*e.g.*, name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

FOR FURTHER INFORMATION CONTACT: Jessica Taylor, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-military-readiness-activities*. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

The MMPA prohibits the "take" of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are proposed or, if the taking is limited to harassment, a notice of a proposed IHA is provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other “means of effecting the least practicable adverse impact” on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to in shorthand as “mitigation”); and requirements pertaining to the mitigation, monitoring and reporting of the takings are set forth.

The 2004 NDAA (Pub. L. 108–136) removed the “small numbers” and “specified geographical region” limitations indicated above and amended the definition of “harassment” as applied to a “military readiness activity.” The activity for which incidental take of marine mammals is being requested addressed here qualifies as a military readiness activity. The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq*.) and NOAA Administrative Order (NAO) 216-6A, NMFS must review our proposed action (*i.e.*, the issuance of an IHA) with respect to potential impacts on the human environment.

In 2018, the U.S. Navy prepared an Overseas Environmental Assessment (OEA; referred to as an EA in this document) analyzing the project. Prior to issuing the IHA for the first year of this project, NMFS reviewed the 2018 EA and the public comments received, determined that a separate NEPA analysis was not necessary, and subsequently adopted the document and issued a NMFS Finding of No Significant Impact (FONSI) in support of the issuance of an IHA (83 FR 48799; September 27, 2018).

In 2019, the U.S. Navy prepared a supplemental EA. Prior to issuing the IHA in 2019, NMFS reviewed the supplemental EA and the public comments received, determined that a separate NEPA analysis was not necessary, and subsequently adopted the document and issued a NMFS FONSI in support of the issuance of an IHA (84 FR 50007; September 24, 2019).

In 2020, the U.S. Navy submitted a request for a renewal of the 2019 IHA. Prior to issuing the renewal IHA, NMFS reviewed ONR's application and determined that the proposed action was identical to that considered in the previous IHA. Because no significantly new circumstances or information relevant to any environmental concerns had been identified, NMFS determined that the preparation of a new or supplemental NEPA document was not necessary and relied on the supplement EA and FONSI from 2019 when issuing the renewal IHA in 2020 (85 FR 41560; July 10, 2020).

In 2021, the U.S. Navy submitted a request for an IHA for incidental take of marine mammals during continuation of ARA. NMFS reviewed the U.S. Navy’s EA and determined it to be sufficient for taking into consideration the direct, indirect, and cumulative effects to the human environment resulting from continuation of the ARA. NMFS subsequently adopted that EA and signed a Finding of No Significant Impact (FONSI) (86 FR 54931, October 5, 2021).

Accordingly, NMFS preliminarily has determined to adopt the U.S. Navy’s OEA for Office of Naval Research Arctic Research Activities in the Beaufort and Chukchi Seas 2022-2025, provided our independent evaluation of the document finds that it includes adequate information analyzing the effects on the human environment of issuing the IHA. NMFS is a not cooperating agency on the U.S. Navy’s OEA.

We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the IHA request.

Summary of Request

On March 21, 2022, NMFS received a request from ONR for an IHA to take marine mammals incidental to ARA in the Beaufort and eastern Chukchi Seas. The application was deemed adequate and complete on June 30, 2022. ONR’s request is for take of beluga whales (*Delphinapterus leucas;* two stocks) and ringed seals (*Pusa hispida hispida*) by Level B harassment. Neither ONR nor NMFS expect serious injury or mortality to result from this activity and, therefore, an IHA is appropriate.

This proposed IHA would cover the fifth year of a larger project for which ONR obtained prior IHAs (83 FR 48799, September 27, 2018; 84 FR 50007, September 24, 2019; 85 FR 53333, August 28, 2020; 86 FR 54931, October 5, 2021) and may request take authorization for subsequent facets of the overall project. This IHA would be valid for a period of one year from the date of issuance (mid-September 2022 to mid- September 2023). The larger project supports the development of an under-ice navigation system under the ONR Arctic Mobile Observing System (AMOS) project. ONR has complied with all the requirements (*e.g.,* mitigation, monitoring, and reporting) of the previous IHAs (83 FR 48799, September 27, 2018; 84 FR 50007, September 24, 2019; 85 FR 53333, August 28, 2020; 86 FR 54931, October 5, 2021).

Description of Proposed Activity

Overview

ONR's ARA include scientific experiments to be conducted in support of the programs named above. Specifically, the project includes the Arctic Mobile Observing System (AMOS) experiments in the Beaufort and Chukchi Seas. Project activities involve acoustic testing and a multi-frequency navigation system concept test using left-behind active acoustic sources. More specifically, these experiments involve the deployment of moored, drifting, and ice-tethered active acoustic sources from the Research Vessel (R/V) Sikuliaq. Another vessel will be used to retrieve the acoustic sources. Underwater sound from the acoustic sources may result in Level B harassment of marine mammals.

Dates and Duration

This proposed action would occur from mid- September 2022 through mid-September 2023. The 2022 cruise would leave from Nome, Alaska on September 14, 2022 using the R/V *Sikuliaq* and involve 120 hours of active source testing. During this first cruise, several acoustic sources would be deployed from the ship. Some acoustic sources will be left behind to provide year-round observation of the Arctic environment. Gliders deployed during the September 2022 cruise may be recovered before the research vessel departs the study area or during a September 2023 cruise. Up to seven fixed acoustic navigation sources transmitting at 900 Hertz (Hz) would remain in place for a year. Drifting and moored oceanographic sensors would record environmental parameters throughout the year. Autonomous weather stations and ice mass balance buoys would also be deployed to record environmental measurements throughout the year (Table 1). The research vessel is planned to return to Nome, Alaska on October 28, 2022. ONR will apply for a renewal or separate IHA, as appropriate, for activities conducted during the planned September 2023 cruise.

During the scope of this proposed project, other activities may occur at different intervals that would assist ONR in meeting the scientific objectives of the various projects discussed above. However, these activities are designated as de minimis sources in ONR's 2022-2023 IHA application (consistent with analyses presented in support of previous Navy ONR IHAs), or would not produce sounds detectable by marine mammals (see discussion on de minimis sources below). These include the deployment of a Woods Hole Oceanographic Institution (WHOI) micromodem, acoustic Doppler current profilers (ADCP), and ice profilers (Table 2).

Geographic Region

This proposed action would occur across the U.S. Exclusive Economic Zone (EEZ) in both the Beaufort and Chukchi Seas, partially in the high seas north of Alaska, the Global Commons, and within a part of the Canadian EEZ (in which the appropriate permits would be obtained by the Navy) (Figure 1). The proposed action would primarily occur in the Beaufort Sea, but the analysis considers the drifting of active sources on buoys into the eastern portion of the Chukchi Sea. The closest point of the study area to the Alaska coast is 110 nm (204 km). The proposed study area is approximately 639,267 km^2.

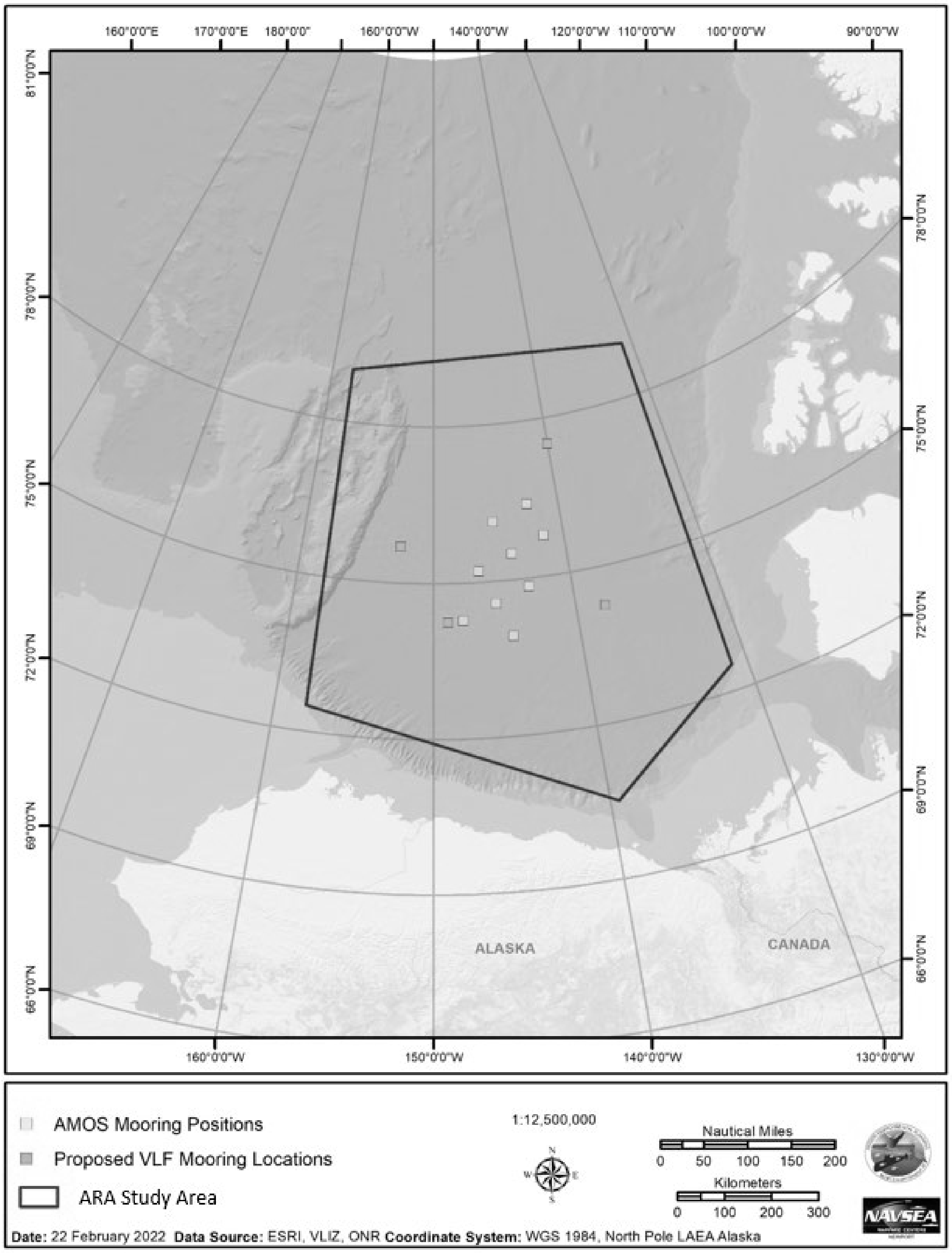

Figure 1. ONR ARA Study Area and Fixed Source Locations

Detailed Description of Specific Activity

The ONR Arctic and Global Prediction Program supports two major projects: Stratified Ocean Dynamics of the Arctic (SODA) and AMOS. The SODA and AMOS projects have been previously discussed in association with previously issued IHAs (83 FR 40234, August 14, 2018; 84 FR 37240, July 31, 2019). However, only activities relating to the AMOS project will occur during the period covered by this proposed action.

The AMOS project constitutes the development of a new system involving very low (35 Hz)), low (900 Hz), and mid-frequency transmissions (10 kilohertz (kHz)). The AMOS project would utilize acoustic sources and receivers to provide a means of performing under-ice navigation for gliders and unmanned underwater vehicles (UUVs). This would allow for the possibility of year-round scientific observations of the environment in the Arctic. As an environment that is particularly affected by climate change, year-round observations under a variety of ice conditions are required to study the effects of this changing environment for military readiness, as well as the implications of environmental change to humans and animals. Very-low frequency technology is important in extending the range of navigation systems. The technology also has the potential to allow for development and use of navigational systems that would not be heard by some marine mammal species, and therefore would be less impactful overall.

Active acoustic sources would be lowered from the cruise vessel while stationary, deployed on gliders and UUVs, or deployed on fixed AMOS moorings. This project would use groups of drifting buoys with sources and receivers communicating oceanographic information to a satellite in near real time. These sources would employ low-frequency transmissions only (900 Hz).

The proposed action would utilize non-impulsive acoustic sources, although not all sources will cause take of marine mammals. Any marine mammal takes would only arise from the operation of non-impulsive active sources. Although not currently planned, ice breaking could occur as part of this proposed action if a research vessel needs to return to the study area before the end of the IHA period to ensure scientific objectives are met. In this case, ice breaking could result in potential Level B harassment takes.

Below are descriptions of the equipment and platforms that would be deployed at different times during the proposed action.

Research Vessels

The R/V *Sikuliaq* would perform the research cruise in September 2022 and conduct testing of acoustic sources during the cruise, as well as leave sources behind to operate as a year-round navigation system observation. R/V *Sikuliaq* has a maximum speed of approximately 12 knots (6.2 m/s) with a cruising speed of 11 knots (5.7 m/s) (University of Alaska Fairbanks 2014). The R/V *Sikuliaq* is not an ice breaking ship, but an ice strengthened ship. It would not be icebreaking and therefore acoustic signatures of icebreaking for the R/V *Sikuliaq* are not relevant.

The ship to be used in September 2023 to retrieve any acoustic sources could potentially be the CGC Healy. CGC Healy travels at a maximum speed of 17 knots (8.7 m/s) with a cruising speed of 12 knots (6.2 m/s) (United States Coast Guard 2013), and a maximum speed of 3 knots (1.5 m/s)when traveling through 4.5 feet (1.07 m) of sea ice (United States Coast Guard 2013). While no icebreaking cruise on the CGC Healy is scheduled during the IHA period, need may arise. Therefore, for the purposes of this IHA application, an icebreaking cruise is considered.

The R/V *Sikuliaq*, CGC Healy, or any other vessel operating a research cruise associated with the proposed action may perform the following activities during their research cruises:

• Deployment of moored and/or ice-tethered passive sensors (oceanographic measurement devices, acoustic receivers);

• Deployment of moored and/or ice-tethered active acoustic sources to transmit acoustic signals;

• Deployment of UUVs;

• Deployment of drifting buoys, with or without acoustic sources; or,

• Recovery of equipment.

Moored and Drifting Acoustic Sources

During the September 2022 cruise, active acoustic sources would be lowered from the cruise vessel while stationary, deployed on gliders and UUVs, or deployed on fixed AMOS moorings. This would be done for intermittent testing of the system components. The total amount of active source testing for ship-deployed sources used during the cruise would be 120 hours. The testing would take place near the seven source locations on Figure 1, with UUVs running tracks within the designated box. During this testing, 35 Hz, 900 Hz, and 10 kHz acoustic signals, as well as acoustic modems would be employed.

Up to seven fixed acoustic navigation sources transmitting at 900 Hz would remain in place for a year and continue transmitting during this time. These moorings would be anchored on the seabed and held in the water column with subsurface buoys. All sources would be deployed by shipboard winches, which would lower sources and receivers in a controlled manner. Anchors would be steel “wagon wheels” typically used for this type of deployment. Two very low frequency (VLF) sources transmitting at 35 Hz would be deployed in a similar manner. Two Ice Gateway Buoys (IGB) would also be configured with active acoustic sources. Autonomous vehicles would be able to navigate by receiving acoustic signals from multiple locations and triangulating. This is needed for vehicles that are under ice and cannot communicate with satellites. Source transmits would be offset by 15 minutes from each other (*i.e.,* sources would not be transmitting at the same time). All navigation sources would be recovered. The purpose of the navigation sources is to orient UUVs and gliders in situations when they are under ice and cannot communicate with satellites. For the purposes of this proposed action, activities potentially resulting in take would not be included in the fall 2023 cruise; a subsequent application would be provided by ONR depending on the scientific plan associated with that cruise.

Table 1. Characteristics for the modeled acoustic sources for the proposed action

Platform	Acoustic Source	Purpose/Function	Frequency	Signal Strength (dB re1uPa @ 1m)[1]	Band Width
REMUS 600 UUV (1)	WHOI[2]/Micro-modem	Acoustic communication	900-950 Hz[3]	NTE[3] 180 dB by sys design limits	50 Hz
	UUV/WHOI Micro-modem	Acoustic communication	8-14 kHz[3]	NTE 185 dB by sys design limits	5 kHz
IGB[3] (drifting) (2)	WHOI Micro-modem	Acoustic communication	900-950 Hz	NTE 180 dB by sys design limits	50 Hz
	WHOI Micro-modem	Acoustic communication	8-14 kHz	NTE 185 dB by sys design limits	5 kHz
Mooring (9)	WHOI Micro-modem (7)	Acoustic navigation	900-950 Hz	NTE 180 dB by sys design limits	50 Hz
	VLF[3] (2)	Acoustic navigation	35 Hz	NTE 190 dB	6 Hz

[1] *dB re 1 µPa at 1 m= decibels referenced to 1 micropascal at 1 meter.*
[2] *WHOI = Woods Hole Oceanographic Institution.*
[3] *Hz= Hertz; IGB= Ice Gateway Buoy; kHz= 1 kilohertz; NTE= not to exceed; VLF= very low frequency*

Activities not likely to result in take

The following in-water activities have been determined to be unlikely to result in take of marine mammals. These activities are described here but they are not discussed further in this document.

De minimis Sources—The Navy characterizes de minimis sources as those with the following parameters: Low source levels, narrow beams, downward directed transmission, short pulse lengths, frequencies outside known marine mammal hearing ranges, or some combination of these factors (Department of the Navy, 2013b). NMFS concurs with the Navy's determination that the sources they have identified here as de minimis are unlikely to result in take of marine mammals. The following are some of the planned de minimis sources which would be used during the proposed action: Woods Hole Oceanographic Institution (WHOI) micromodem, ADCPs, ice profilers, and additional sources below 160 dB re 1 μPa used during towing operations. ADCPs may be used on moorings. Ice-profilers measure ice properties and roughness. The ADCPs and ice-profilers would all be above 200 kHz and therefore out of marine mammal hearing ranges, with the exception of the 75 kHz ADCP which has the characteristics and de minimis justification listed in Table 2. They may be employed on moorings or UUVs. Descriptions of some de minimis sources are discussed below and in Table 2. More detailed descriptions of these de minimis sources can be found in ONR's IHA application under Section 1.1.1.2.

Table 2. Parameters for de minimis non-impulsive active sources

Source Name	Frequency Range (kHz)	Sound Pressure Level (dB re 1 μPa at 1 m)	Pulse Length (s)	Duty Cycle (percent)	De minimis Justification
ADCP	>200, 150, or 75	190	<0.001	<0.1	Very low pulse length, narrow beam, moderate source level
Nortek Signature 500 kHz Doppler Velocity Log	500	214	<0.1	<13	Very high frequency
CTD[1] Attached Echosounder	5-20	160	0.004	2	Very low source level

[1] *Conductivity Temperature Depth*

Drifting Oceanographic Sensors

Observations of ocean-ice interactions require the use of sensors that are moored and embedded in the ice. For the proposed action, it will not be required to break ice to do this, as deployments can be performed in areas of low ice-coverage or free floating ice. Sensors are deployed within a few dozen meters of each other on the same ice floe. Three types of sensors would be used: autonomous ocean flux buoys, Integrated Autonomous Drifters, and ice-tethered profilers. The autonomous ocean flux buoys measure oceanographic properties just below the ocean-ice interface. The autonomous ocean flux buoys would have ADCPs and temperature chains attached, to measure temperature, salinity, and other ocean parameters in the top 20 ft (6 m) of the water column. Integrated Autonomous Drifters would have a long temperate string extending down to 656 ft (200 m) depth and would incorporate meteorological sensors, and a temperature spring to estimate ice thickness. The ice-tethered profilers would collect information on ocean temperature, salinity and velocity down to 820 ft (250 m) depth.

Up to 20 Argo-type autonomous profiling floats may be deployed in the central Beaufort Sea. Argo floats drift at 4,921 ft (1,500 m) depth, profiling from 6,562 ft (2,000 m) to the sea surface once every 10 days to collect profiles of temperature and salinity.

Moored Oceanographic Sensors

Moored sensors would capture a range of ice, ocean, and atmospheric conditions on a year-round basis. These would be bottom anchored, sub-surface moorings measuring velocity, temperature, and salinity in the upper 1,640 ft (500 m) of the water column. The moorings also collect high-resolution acoustic measurements of the ice using the ice profilers described above. Ice velocity and surface waves would be measured by 500 kHz multibeam sonars from Nortek Signatures. The moored oceanographic sensors described above use only de minimis sources and are therefore not anticipated to have the potential for impacts on marine mammals or their habitat.

On-Ice Measurements

On-ice measurement systems would be used to collect weather data. These would include an Autonomous Weather Station and an Ice Mass Balance Buoy. The Autonomous Weather Station would be deployed on a tripod; the tripod has insulated foot platforms that are frozen into the ice. The system would consist of an anemometer, humidity sensor, and pressure sensor. The Autonomous Weather Station also includes an altimeter with a sound source that is de minimis due to its very high frequency (200 kHz). The Ice Mass Balance Buoy is a 20 ft (6 m) sensor string, which is deployed through a 2 inch (5 cm) hole drilled into the ice. The string is weighted by a 2.2 lb (1 kg) lead weight, and is supported by a tripod. The buoy contains a de minimis 200 kHz altimeter and snow depth sensor. Autonomous Weather Stations and Ice Mass Balance Buoys will be deployed, and will drift with the ice, making measurements. The instruments are destroyed as their host ice floes melt (likely in summer, roughly one year after deployment). After the instruments are deployed they cannot be recovered, and would sink to the seafloor as their host ice floes melted.

Proposed mitigation, monitoring, and reporting measures are described in detail later in this document (please see **Proposed Mitigation** and **Proposed Monitoring and Reporting**).

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history of the potentially affected species. NMFS fully considered all of this information, and we refer the reader to these descriptions, incorporated here by reference, instead of reprinting the information. Additional information regarding population trends and threats may be found in NMFS' Stock Assessment Reports (SARs; *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS' website (*https://www.fisheries.noaa.gov/find-species)*.

Table 3 lists all species or stocks for which take is expected and proposed to be authorized for this action, and summarizes information related to the population or stock, including regulatory status under the MMPA and Endangered Species Act (ESA) and potential biological removal (PBR), where known. PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS' SARs). While no serious injury or mortality is anticipated or authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS' stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS' U.S. 2020 SARs (*e.g.*, Muto *et al.* 2021), with the exception of Beaufort Sea beluga whales. The 2020 SAR for the Beaufort Sea stock of beluga whales has temporarily been withdrawn for further review, therefore, the NMFS' U.S. 2021 draft SAR represents the most recent stock assessment for this stock. All values presented in Table 3 are the most recent available at the time of publication (including from the draft 2021 SARs) online at: *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*).

Table 3. Species Likely Impacted by the Specified Activities

Common name	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N)[1]	Stock abundance (CV, Nmin, most recent abundance survey)[2]	PBR	Annual M/SI[3]
Order Cetartiodactyla – Cetacea – Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Monodontidae						
Beluga Whale	*Delphinapterus leucas*	Beaufort Sea	-, -, N	39,258 (0.229, N/A, 1992)	UND[4]	104
Beluga Whale	*Delphinapterus leucas*	Eastern Chukchi Sea	-, -, N	13,305 (0.51, 8,875, 2012)	178	55
Order Carnivora – Superfamily Pinnipedia						
Family Phocidae (earless seals)						
Ringed Seal[5]	*Pusa hispida hispida*	Arctic	T, D, Y	171,418 (N/A, 158,507, 171,418	5,100	6,459

[1] Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.
[2] NMFS marine mammal stock assessment reports online at: www.nmfs.noaa.gov/pr/sars/. CV is the coefficient of variation; Nmin is the minimum estimate of stock abundance. In some cases, CV is not applicable [explain if this is the case].
[3] These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (e.g., commercial fisheries, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.
[4] The 2016 guidelines for preparing SARs state that abundance estimates older than 8 years should not be used to calculate PBR due to a decline in the reliability of an aged estimate. Therefore, the PBR for this stock is considered undetermined.
[5] Abundance and associated values for ringed seals are for the U.S. population in the Bering Sea only.

As indicated above, the two species (with three managed stocks) in Table 3 temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur. While bowhead whales (*Balaena mysticetus*), gray whales (*Eschrichtius robustus*), bearded seals (*Erignathus barbatus*), spotted seals (*Phoca largha*), ribbon seals (*Histiophoca fasciata*), have been documented in the area, the temporal and/or spatial occurrence of these species is such that take is not expected to occur, and they are not discussed further beyond the explanation provided below.

Due to the location of the study area (*i.e.,* northern offshore, deep water), there were no calculated exposures for the bowhead whale, gray whale, spotted seal, bearded seal, and ribbon seal from quantitative modeling of acoustic sources. Bowhead and gray whales are closely associated with the shallow waters of the continental shelf in the

Beaufort Sea and are unlikely to be exposed to acoustic harassment from this activity (Carretta *et al.,* 2018; Muto *et al.,* 2018). Similarly, spotted seals tend to prefer pack ice areas with water depths less than 200 m during the spring and move to coastal habitats in the summer and fall, found as far north as 69-72° N (Muto *et al.,* 2018). Although the study area includes some waters south of 72° N, the acoustic sources with the potential to result in take of marine mammals are not found below that latitude and spotted seals are not expected to be exposed. Ribbon seals are found year-round in the Bering Sea but may seasonally range into the Chukchi Sea (Muto *et al.,* 2018). The proposed action occurs primarily in the Beaufort Sea, outside of the core range of ribbon seals, thus ribbon seals are not expected to be behaviorally harassed. Narwhals (*Monodon monoceros*) are considered extralimital in the project area and are not expected to be encountered. As no harassment is expected of the bowhead whale, gray whale, spotted seal, bearded seal, narwhal, and ribbon seal, these species will not be discussed further in this proposed notice.

The Navy has utilized Conn *et al.,* (2014) in their IHA application as an abundance estimate for ringed seals, which is based upon aerial abundance and distribution surveys conducted in the U.S. portion Bering Sea in 2012 (171,418 ringed seals; Muto *et al.,* 2021b). This value is likely an underestimate due to the lack of accounting for availability bias for seals that were in the water at the time of the surveys as well as not including seals located within the shorefast ice zone (Muto *et al.,* 2021b). Muto *et al.,* (2021b) notes that an accurate population estimate is likely larger by a factor of two or more. However, no accepted population estimate is present for Arctic ringed seals. Therefore, in the interest in making conservative decisions, NMFS will also adopt the Conn *et al.,* (2014) abundance estimate (171,418) for further analyses and discussions on this proposed action by ONR.

In addition, the polar bear (*Ursus maritimus*) and Pacific walrus (*Odobenus rosmarus*) may be found both on sea ice and/or in the water within the Beaufort Sea and Chukchi Sea. These species are managed by the U.S. Fish and Wildlife Service (USFWS) and are not considered further in this document.

Beluga Whale

Beluga whales are distributed throughout seasonally ice-covered arctic and subarctic waters of the Northern Hemisphere (Gurevich, 1980), and are closely associated with open leads and polynyas in ice-covered regions (Hazard, 1988). Belugas are both migratory and residential (non-migratory), depending on the population. Seasonal distribution is affected by ice cover, tidal conditions, access to prey, temperature, and human interaction (Frost *et al.,* 1985; Hauser *et al.,* 2014).

There are five beluga stocks recognized within U.S. waters: Cook Inlet, Bristol Bay, eastern Bering Sea, eastern Chukchi Sea, and Beaufort Sea. Two stocks, the Beaufort Sea and eastern Chukchi Sea stocks, have the potential to occur in the location of this proposed action.

A migratory Biologically Important Area (BIA) for belugas in the Eastern Chukchi and Alaskan Beaufort Sea overlaps the southern and western portion of the proposed project site. One migration corridor is in use from April to May. The second corridor, located in the Alaskan Beaufort Sea, is used by migrating belugas from September to October (Calambokidis *et al.,* 2015). During the winter, they can be found foraging in offshore waters associated with pack ice. When the sea ice melts in summer, they move to warmer river estuaries and coastal areas for molting and calving (Muto *et al.,* 2017). Annual migrations can span over thousands of kilometers. The residential Beaufort Sea populations participate in short distance movements within their range throughout the year. Based on satellite tags (Suydam *et al.,* 2001; Hauser *et al.,* 2014), there is some overlap in distribution with the eastern Chukchi Sea beluga whale stock.

During the winter, eastern Chukchi Sea belugas occur in offshore waters associated with pack ice. In the spring, they migrate to warmer coastal estuaries, bays, and rivers where they may molt (Finley, 1982; Suydam, 2009), give birth to, and care for their calves (Sergeant and Brodie, 1969). Eastern Chukchi Sea belugas move into coastal areas, including Kasegaluk Lagoon (outside of the proposed project site), in late June and animals are sighted in the area until about mid-July (Frost and Lowry, 1990; Frost *et al.,* 1993). Satellite tags attached to eastern Chukchi Sea belugas captured in Kasegaluk Lagoon during the summer showed these whales traveled 593 nm (1,100 km) north of the Alaska coastline, into the Canadian Beaufort Sea within three months (Suydam *et al.,* 2001). Satellite telemetry data from 23 whales tagged during 1998-2007 suggest variation in movement patterns for different age and/or sex classes during July-September (Suydam *et al.,* 2005). Adult males used deeper waters and remained there for the duration of the summer; all belugas that moved into the Arctic Ocean (north of 75° N) were males, and males traveled through 90 percent pack ice cover to reach deeper waters in the Beaufort Sea and Arctic Ocean (79-80° N) by late July/early August. Adult and immature female belugas remained at or near the shelf break in the south through the eastern Bering Strait into the northern Bering Sea, remaining north of Saint Lawrence Island over the winter.

Ringed Seals

Ringed seals are the most common pinniped in the proposed project site and have wide distribution in seasonally and permanently ice-covered waters of the Northern Hemisphere (North Atlantic Marine Mammal Commission, 2004). Throughout their range, ringed seals have an affinity for ice-covered waters and are well adapted to occupying both shore-fast and pack ice (Kelly, 1988c). Ringed seals can be found further offshore than other pinnipeds since they can maintain breathing holes in ice thickness greater than 6.6 ft (2 m) (Smith and Stirling, 1975). The breathing holes are maintained by ringed seals using their sharp teeth and claws found on their fore flippers. They remain in contact with ice most of the year and use it as a platform for molting in late spring to early summer, for pupping and nursing in late winter to early spring, and for resting at other times of the year (Muto *et al.,* 2018).

Ringed seals have at least two distinct types of subnivean lairs: Haulout lairs and birthing lairs (Smith and Stirling, 1975). Haul-out lairs are typically single-chambered and offer protection from predators and cold weather. Birthing lairs are larger, multi-chambered areas that are used for pupping in addition to protection from predators. Ringed seals pup on both land-fast ice as well as stable pack ice. Lentfer (1972) found that ringed seals north of Utqiaġvik, Alaska (formally known as Barrow, Alaska) build their subnivean lairs on the pack ice near pressure ridges. Since subnivean lairs were found north of Utqiaġvik, Alaska, in pack ice, they are also assumed to be found within the sea ice in the proposed project site. Ringed seals excavate subnivean lairs in drifts over their breathing holes in the ice, in which they rest, give birth, and nurse their pups for 5-9 weeks during late winter and spring (Chapskii, 1940; McLaren, 1958; Smith and Stirling, 1975). Ringed seals are born beginning in March, but the majority of births occur in early April. About a month after parturition, mating begins in late April and early May.

In Alaskan waters, during winter and early spring when sea ice is at its maximum extent, ringed seals are abundant in the northern Bering Sea, Norton and Kotzebue Sounds, and throughout the Chukchi and Beaufort seas (Frost, 1985; Kelly, 1988c). Passive acoustic monitoring of ringed seals from a high frequency recording package deployed at a depth of 787 ft (240 m) in the Chukchi Sea 65 nautical miles (120 km) north-northwest of Utqiaġvik, Alaska detected ringed seals in the area between mid-December and late May over the 4 year study (Jones *et al.,* 2014). In addition, ringed seals have been observed near and beyond the outer boundary of the U.S. EEZ (Beland

and Ireland, 2010). During the spring and early summer, ringed seals may migrate north as the ice edge recedes and spend their summers in the open water period of the northern Beaufort and Chukchi Seas (Frost, 1985). Foraging-type movements have been recorded over the continental shelf and north of the continental shelf waters (Von Duyke *et al.,* 2020). During this time, sub-adult ringed seals may also occur in the Arctic Ocean Basin (Hamilton *et al.,* 2015; Hamilton *et al.,* 2017).

With the onset of fall freeze, ringed seal movements become increasingly restricted and seals will either move west and south with the advancing ice pack with many seals dispersing throughout the Chukchi and Bering Seas, or remaining in the Beaufort Sea (Crawford *et al.,* 2012; Frost and Lowry, 1984; Harwood *et al.,* 2012). Kelly *et al.,* (2010b) tracked home ranges for ringed seals in the subnivean period (using shore-fast ice); the size of the home ranges varied from less than 1 up to 279 km^2 (median is 0.62 km^2 for adult males and 0.65 km^2 for adult females). Most (94 percent) of the home ranges were less than 3 km^2 during the subnivean period (Kelly *et al.,* 2010b). Near large polynyas, ringed seals maintain ranges, up to 7,000 km^2 during winter and 2,100 km^2 during spring (Born *et al.,* 2004). Some adult ringed seals return to the same small home ranges they occupied during the previous winter (Kelly *et al.,* 2010b). The size of winter home ranges can vary by up to a factor of 10 depending on the amount of fast ice; seal movements were more restricted during winters with extensive fast ice, and were much less restricted where fast ice did not form at high levels (Harwood *et al.,* 2015).

Of the five recognized subspecies of ringed seals, the Arctic ringed seal occurs in the Arctic Ocean and Bering Sea and is the only stock that occurs in U.S. waters. NMFS listed the Arctic ringed seal subspecies as threatened under the ESA on December 28, 2012 (77 FR 76706), primarily due to anticipated loss of sea ice through the end of the 21st century. Climate change presents a major concern for the conservation of ringed seals due to the potential for long-term habitat loss and modification (Muto *et al.*, 2021). Based upon an analysis of various life history features and the rapid changes that may occur in ringed seal habitat, ringed seals are expected to be highly sensitive to climate change (Laidre *et al.,* 2008; Kelly *et al.,* 2010a).

Critical Habitat

On January 8, 2021, NMFS published a revised proposed rule for the Designation of Critical Habitat for the Arctic Subspecies of the Ringed Seal (86 FR 1452). This proposed rule revises NMFS' December 9, 2014, proposed designation of critical habitat for the Arctic subspecies of the ringed seal under the ESA. NMFS identified the physical and biological features essential to the conservation of the species: (1) Snow-covered sea ice habitat suitable for the formation and maintenance of subnivean birth lairs used for sheltering pups during whelping and nursing, which is defined as areas of seasonal landfast (shorefast) ice and dense, stable pack ice, excluding any bottom-fast ice extending seaward from the coastline (typically in waters less than 2 m deep), that have undergone deformation and contain snowdrifts of sufficient depth, typically at least 54 cm deep; (2) Sea ice habitat suitable as a platform for basking and molting, which is defined as areas containing sea ice of 15 percent or more concentration, excluding any bottom-fast ice extending seaward from the coastline (typically in waters less than 2 m deep); and (3) Primary prey resources to support Arctic ringed seals, which are defined to be Arctic cod, saffron cod, shrimps, and amphipods. The revised proposed critical habitat designation comprises a specific area of marine habitat in the Bering, Chukchi, and Beaufort seas, extending from mean lower low water to an offshore limit within the U.S. Exclusive Economic Zone, including a portion of the ONR ARA Study Area (86 FR 1452; January 8, 2021). See the proposed ESA critical habitat rule for additional detail and a map of the proposed area.

The majority of the proposed study area was excluded from the proposed ringed seal critical habitat because the benefits of exclusion due to national security impacts outweighed the benefits of inclusion of this area (86 FR 1452; March 9, 2021). However, as stated in NMFS' second revised proposed rule for the Designation of Critical Habitat for the Arctic Subspecies of the Ringed Seal (86 FR 1452; March 9, 2021), the excluded area contains one or more of the essential features of the Arctic ringed seal's critical habitat. However, the excluded area contains features that are found throughout the specific area designated as critical habitat (87 FR 19232, April 1, 2022), therefore even though this area is excluded from critical habitat designation, habitat with the physical and biological features essential for ringed seal conservation is still available to the species. A small portion of the study area overlaps with ringed seal critical habitat as shown in Figure 2. As described later and in more detail in the **Potential Effects of Specified Activities on Marine Mammals and Their Habitat** section, we expect minimal impacts to marine mammal habitat as a result of the ONR’s activities, including impacts on prey availability.

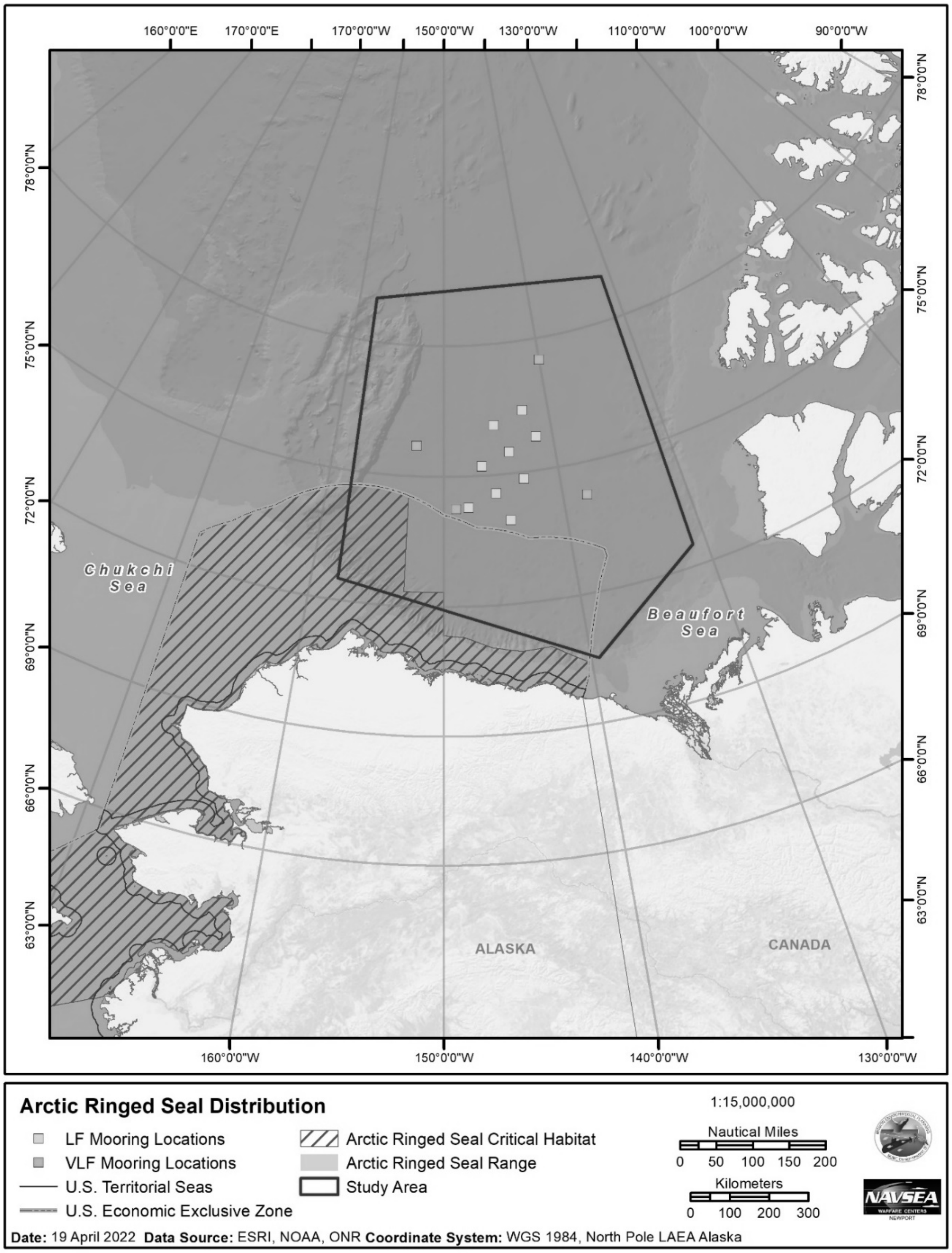

Figure 2. ONR ARA Study Area and Ringed Seal Critical Habitat Overlap

Since June 1, 2018, elevated strandings of ringed seals, bearded seals, spotted seals, and several unidentified seals have occurred in the Bering and Chukchi Seas. The National Oceanic and Atmospheric Administration (NOAA), as of September 2019, have declared this event an Unusual Mortality Event (UME). A UME is defined under the MMPA as a stranding that is unexpected, involves a significant die-off of any marine mammal population, and demands immediate response. From June 1, 2018 to January 7, 2022, there have been 368 dead seals reported, with 111 stranding in 2018, 164 in 2019, and 38 in 2020, and 55 in 2021, which is much greater than the average number of strandings of about 29 seals annually. All age classes of seals have been reported stranded, and a subset of seals have been sampled for genetics and harmful algal bloom /exposure, with a few having histopathology collected. Results are pending and investigation into the cause of the UME is ongoing, yet currently unknown. No ice seals have stranded in 2022, at the time of this publication, yet the UME is still considered ongoing.

There was a previous UME involving ice seals from 2011 to 2016, which was most active in 2011-2012. A minimum of 657 seals were affected. The UME investigation determined that some of the clinical signs were due to an abnormal molt, but a definitive cause of death for the UME was never determined. The number of stranded ice seals involved in this UME, and their physical characteristics, is not at all similar to the 2011-2016 UME, as the seals in 2018-2020 have not been exhibiting hair loss or skin lesions, which were a primary finding in the 2011-2016 UME. More detailed information is available at: *https://www.fisheries.noaa.gov/alaska/marine-life-distress/2018-2022-ice-seal-unusual-mortality-event-alaska.*

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007, 2019) recommended that marine mammals be divided into hearing groups based on directly measured (behavioral or auditory evoked potential techniques) or estimated hearing ranges (behavioral response data, anatomical modeling, etc.). Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.*, low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 4.

Table 4. Marine Mammal Hearing Groups (NMFS, 2018).

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, *Kogia*, river dolphins, Cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz
* Represents the generalized hearing range for the entire group as a composite (*i.e.*, all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall *et al*., 2007) and PW pinniped (approximation).	

The pinniped functional hearing group was modified from Southall *et al*. (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al*., 2006; Kastelein *et al*., 2009; Reichmuth and Holt, 2013).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information.

Potential Effects of Specified Activities on Marine Mammals and their Habitat

This section includes a discussion of the ways that components of the specified activity may impact marine mammals and their habitat. The **Estimated Take** section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The **Negligible Impact Analysis and Determination** section considers the content of this section, the **Estimated Take** section, and the **Proposed Mitigation** section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and how those impacts on individuals may or may not impact marine mammal species or stocks.

Description of Sound Sources

Here, we first provide background information on marine mammal hearing before discussing the potential effects of the use of active acoustic sources on marine mammals.

Sound travels in waves, the basic components of which are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in Hz or cycles per second. Wavelength is the distance between two peaks of a sound wave; lower frequency sounds have longer wavelengths than higher frequency sounds and attenuate (decrease) more rapidly in shallower water. Amplitude is the height of the sound pressure wave or the `loudness' of a sound and is typically measured using the dB scale. A dB is the ratio between a measured pressure (with sound) and a reference pressure (sound at a constant pressure, established by scientific standards). It is a logarithmic unit that accounts for large variations in amplitude; therefore, relatively small changes in dB ratings correspond to large changes in sound pressure. When referring to sound pressure levels (SPLs; the sound force per unit area), sound is referenced in the context of underwater sound pressure to one micropascal (1 μPa). One pascal is the pressure resulting from a force of one newton exerted over an area of one square meter. The source level (SL) represents the sound level at a distance of 1 m from the source (referenced to 1 μPa). The received level is the sound level at the listener's position. Note that all underwater sound levels in this document are referenced to a pressure of 1 μPa.

Root mean square (rms) is the quadratic mean sound pressure over the duration of an impulse. RMS is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick, 1983). RMS accounts for both positive and negative values; squaring the pressures makes all values positive so that they may be accounted for in the summation of pressure levels (Hastings and Popper, 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units than by peak pressures.

When underwater objects vibrate or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in all directions away from the source (similar to ripples on the surface of a pond), except in cases where the source is directional. The compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and man-made sound receptors such as hydrophones.

The marine soundscape is comprised of both ambient and anthropogenic sounds. Ambient sound is defined as the all-encompassing sound in a given place and is usually a composite of sound from many sources both near and far (ANSI, 1995). The sound level of an area is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.,* waves, wind, precipitation, earthquakes, ice, atmospheric sound), biological (*e.g.,* sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.,* vessels, dredging, aircraft, construction).

The sum of the various natural and anthropogenic sound sources at any given location and time—which comprise "ambient" or "background" sound—depends not only on the source levels (as determined by current weather conditions and levels of biological and shipping activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. Because of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10-20 dB from day to day (Richardson *et al.,* 1995). The result is that, depending on the source type and its intensity, sound from the specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

Underwater sounds fall into one of two general sound types: impulsive and non-impulsive (defined in the following paragraphs). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.,* Ward, 1997 in Southall *et al.,* 2007). Please see Southall *et al.,* (2007) for an in-depth discussion of these concepts.

Impulsive sound sources (*e.g.,* explosions, gunshots, sonic booms, impact pile driving) produce signals that are brief (typically considered to be less than one second), broadband, atonal transients (ANSI, 1986; Harris, 1998; NIOSH, 1998; ISO, 2003; ANSI, 2005) and occur either as isolated events or repeated in some succession. Impulsive sounds are all characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a rapid decay period that may include a period of diminishing, oscillating maximal and minimal pressures, and generally have an increased capacity to induce physical injury as compared with sounds that lack these features. However and as previously noted, no impulsive acoustic sources will be used during ONR's proposed action.

Non-impulsive sounds can be tonal, narrowband, or broadband, brief or prolonged, and may be either continuous or non-continuous (ANSI, 1995; NIOSH, 1998). Some of these non-impulsive sounds can be transient signals of short duration but without the essential properties of pulses (*e.g.,* rapid rise time). Examples of non-impulsive sounds include those produced by vessels, aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar sources that intentionally direct a sound signal at a target that is reflected back in order to discern physical details about the target. These active sources are used in navigation, military training and testing, and other research activities such as the activities planned by ONR as part of the proposed action. The duration of such sounds, as received at a distance, can be greatly extended in a highly reverberant environment.

Acoustic Impacts

Please refer to the information given previously regarding sound, characteristics of sound types, and metrics used in this document. Anthropogenic sounds cover a broad range of frequencies and sound levels and can have a range of highly variable impacts on marine life, from none or minor to potentially severe responses, depending on received levels, duration of exposure, behavioral context, and various other factors. The potential effects of underwater sound from active acoustic sources can potentially result in one or more of the following: temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, stress, and masking (Richardson *et al.,* 1995; Gordon *et al.,* 2003; Nowacek *et al.,* 2007; Southall *et al.,* 2007; Gotz *et al.,* 2009). The degree of effect is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure. In general, sudden, high level sounds can cause hearing loss, as can longer exposures to lower level sounds. Temporary or permanent loss of hearing will occur almost exclusively for noise within an animal's hearing range. In this section, we first describe specific manifestations of acoustic effects before providing discussion specific to the proposed activities in the next section.

Permanent Threshold Shift—Marine mammals exposed to high-intensity sound, or to lower-intensity sound for prolonged periods, can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Finneran, 2015). TS can be permanent (PTS), in which case the loss of hearing sensitivity is not fully recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall *et al.,* 2007). Repeated sound exposure that leads to TTS could cause PTS. In severe cases of PTS, there can be total or partial deafness, while in most cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter, 1985).

Temporary Threshold Shift—TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter, 1985). While experiencing TTS, the hearing threshold rises, and a sound must be at a higher level in order to be heard. In terrestrial and marine mammals, TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, hearing sensitivity recovers rapidly after exposure to the sound ends.

When PTS occurs, there is physical damage to the sound receptors in the ear (*i.e.,* tissue damage), whereas TTS represents primarily tissue fatigue and is reversible (Southall *et al.,* 2007). In addition, other investigators have suggested that TTS is within the normal bounds of physiological variability and tolerance and does not represent physical injury (*e.g.,* Ward, 1997). Therefore, NMFS does not consider TTS to constitute auditory injury.

Relationships between TTS and PTS thresholds have not been studied in marine mammals—PTS data exists only for a single harbor seal (Kastak *et al.,* 2008)—but are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several decibels above (a 40-dB threshold shift approximates PTS onset; *e.g.,* Kryter *et al.,* 1966; Miller, 1974) that inducing mild TTS (a 6-dB threshold shift approximates TTS onset; *e.g.,* Southall *et al.,* 2007). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds for impulse sounds (such as impact pile driving pulses as received close to the source) are at least six dB higher than the TTS threshold on a peak-pressure basis and PTS cumulative sound exposure level (SEL) thresholds are 15 to 20 dB higher than TTS cumulative SEL thresholds (Southall *et al.,* 2007).

Marine mammal hearing plays a critical role in communication with conspecifics, and interpretation of environmental cues for purposes such as predator avoidance and prey capture. Depending on the degree (elevation of threshold in dB), duration (*i.e.,* recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious. For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that occurs during a time where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts.

Many studies have examined noise-induced hearing loss in marine mammals (see Finneran (2015) and Southall *et al.* (2019) for summaries). For cetaceans, published data on the onset of TTS are limited to the captive bottlenose dolphin, beluga, harbor porpoise, and Yangtze finless porpoise, and for pinnipeds in water, measurements of TTS are limited to harbor seals, elephant seals, and California sea lions. These studies examine hearing thresholds measured in marine mammals before and after exposure to intense sounds. The difference between the pre-exposure and post-exposure thresholds can be used to determine the amount of threshold shift at various post-exposure times. The amount and onset of TTS depends on the exposure frequency. Sounds at low frequencies, well below the region of best sensitivity, are less hazardous than those at higher frequencies, near the region of best sensitivity (Finneran and Schlundt, 2013). At low frequencies, onset-TTS exposure levels are higher compared to those in the region of best sensitivity *(i.e.,* a low frequency noise would need to be louder to cause TTS onset when TTS exposure level is higher), as shown for harbor porpoises and harbor seals (Kastelein *et al.,* 2019a, 2019b, 2020a, 2020b). In addition, TTS can accumulate across multiple exposures, but the resulting TTS will be less than the TTS from a single, continuous exposure with the same SEL (Finneran *et al.*, 2010; Kastelein *et al.*, 2014; Kastelein *et al.*, 2015a; Mooney *et al.*, 2009). This means that TTS predictions based on the total, cumulative SEL will overestimate the amount of TTS from intermittent exposures such as sonars and impulsive sources. Nachtigall *et al.* (2018) and Finneran (2018) describe the measurements of hearing sensitivity of multiple odontocete species (bottlenose dolphin, harbor porpoise, beluga, and false killer whale) when a relatively loud sound was preceded by a warning sound. These captive animals were shown to reduce hearing sensitivity when warned of an impending intense sound. Based on these experimental observations of captive animals, the authors suggest that wild animals may dampen their hearing during prolonged exposures or if conditioned to anticipate intense sounds. Another study showed that echolocating animals (including odontocetes) might have anatomical specializations that might allow for conditioned hearing reduction and filtering of low-frequency ambient noise, including increased stiffness and control of middle ear structures and placement of inner ear structures (Ketten *et al*., 2021). Data available on noise-induced hearing loss for mysticetes are currently lacking (NMFS, 2018).

Behavioral effects—Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*e.g.,* minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.,* species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.,* Richardson *et al.,* 1995; Wartzok *et al.,* 2003; Southall *et al.,* 2007; Weilgart, 2007; Archer *et al.,* 2010; Southall *et al.,* 2021). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al.,* 2012), and can vary depending on characteristics associated with the sound source (*e.g.,* whether it is moving or stationary, number of sources, distance from the source). A review of marine mammal responses to anthropogenic sound was first conducted by Richardson (1995). More recent reviews (Nowacek *et al*., 2007; Ellison *et al*., 2012; Gomez *et al*., 2016) addressed studies conducted since 1995 and focused on observations where the received sound level of the exposed marine mammal(s) was known or could be estimated. Gomez *et al.* (2016) conducted a review of the literature considering the contextual information of exposure in addition to received level and found that higher received levels were not always associated with more severe behavioral responses and vice versa. Southall *et al.* (2016) states that results demonstrate that some individuals of different species display clear yet varied responses, some of which have negative implications, while others appear to tolerate high levels, and that responses may not be fully predictable with simple acoustic exposure metrics (*e.g.*, received sound level). Rather, the authors state that differences among species and individuals along with contextual aspects of exposure (*e.g.*, behavioral state) appear to affect response probability.

The following subsections provide examples of behavioral responses that provide an idea of the variability in behavioral responses that would be expected given the differential sensitivities of marine mammal species to sound and the wide range of potential acoustic sources to which a marine mammal may be exposed. Behavioral responses that could occur for a given sound exposure should be determined from the literature that is available for each species, or extrapolated from closely related species when no information exists, along with contextual factors. Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, the stock, or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.,* Lusseau and Bejder, 2007; Weilgart, 2007; NRC, 2003). There are broad categories of potential response, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight.

Changes in dive behavior can vary widely, and may consist of increased or decreased dive times and surface intervals as well as changes in the rates of ascent and descent during a dive (*e.g.,* Frankel and Clark, 2000; Costa *et al.,* 2003; Ng and Leung, 2003; Nowacek *et al.,* 2004; Goldbogen *et al.,* 2013). Seals exposed to non-impulsive sources with a received sound pressure level within the range of calculated exposures (142-193 dB re 1 μPa), have been shown to change their behavior by modifying diving activity and avoidance of the sound source (Götz *et al.,* 2010; Kvadsheim *et al.,* 2010). Variations in dive behavior may reflect interruptions in biologically significant activities (*e.g.,* foraging) or they may be of little biological significance. The impact of an alteration to dive behavior resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (*e.g.,* bubble nets or sediment plumes), or changes in dive behavior. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.,* Croll *et al.,* 2001; Nowacek *et al.;* 2004; Madsen *et al.,* 2006; Yazvenko *et al.,* 2007; Melcón *et al.,* 2012). In addition, behavioral state of the animal plays a role in the type and severity of a behavioral response, such as disruption to foraging (*e.g.,* Silve *et al.,* 2016; Wensveen *et al.,* 2017). A determination of whether foraging disruptions incur fitness consequences would require information on or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal. Goldbogen *et al*. (2013) indicate that disruption of feeding and displacement could impact individual fitness and health. However, for this to be true, we would have to assume that an individual could not compensate for this lost feeding opportunity by either immediately feeding at another location, by feeding shortly after cessation of acoustic exposure, or by feeding at a later time. There is no indication this is the case, particularly since unconsumed prey would likely still be available in the environment in most cases following the cessation of acoustic exposure. Information on or estimates of the energetic requirements of the individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal will help better inform a determination of whether foraging disruptions incur fitness consequences.

Respiration naturally varies with different behaviors, and variations in respiration rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Studies with captive harbor porpoises showed increased respiration rates upon introduction of acoustic alarms (Kastelein *et al.*, 2001; Kastelein *et al.*, 2006) and emissions for underwater data transmission (Kastelein *et al.*, 2005). Various studies also have shown that species and signal characteristics are important factors in whether respiration rates are unaffected or change, again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure (*e.g.,* Kastelein *et al.,* 2005, 2006, 2018; Gailey *et al.,* 2007; Isojunno *et al.*, 2018).

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need to compete with an increase in background noise or may reflect increased vigilance or a startle response. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al.,* 2000; Fristrup *et al.,* 2003; Foote *et al.,* 2004), while right whales have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al.,* 2007;

Rolland *et al.,* 2012). Killer whales off the northwestern coast of the United States have been observed to increase the duration of primary calls once a threshold in observing vessel density (*e.g.*, whale watching) was reached, which has been suggested as a response to increased masking noise produced by the vessels (Foote *et al.*, 2004; NOAA, 2014). In some cases, however, animals may cease or alter sound production in response to underwater sound (*e.g.,* Bowles *et al.,* 1994; Castellote *et al.,* 2012; Cerchio *et al.,* 2014). Studies also demonstrate that even low levels of noise received far from the noise source can induce changes in vocalization and/or behavioral responses (Blackwell *et al.,* 2013, 2015).

Avoidance is the displacement of an individual from an area or migration path as a result of the presence of a sound or other stressors, and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al.,* 1995). Avoidance is qualitatively different from the flight response, but also differs in the magnitude of the response (*i.e.*, directed movement, rate of travel, *etc.*). Oftentimes avoidance is temporary, and animals return to the area once the noise has ceased. Acute avoidance responses have been observed in captive porpoises and pinnipeds exposed to a number of different sound sources (Kastelein *et al.*, 2001; Finneran *et al.*, 2003; Kastelein *et al.*, 2006a; Kastelein *et al.*, 2006b; Kastelein *et al.,* 2015b; Kastelein *et al.*, 2015c; Kastelein *et al*., 2018). Short-term avoidance of seismic surveys, low frequency emissions, and acoustic deterrents have also been noted in wild populations of odontocetes (Bowles *et al.*, 1994; Goold, 1996; Goold and Fish, 1998; Stone *et al.*, 2000; Morton and Symonds, 2002; Hiley *et al*., 2021) and to some extent in mysticetes (Malme *et al.*, 1984; McCauley *et al.*, 2000; Gailey *et al.*, 2007). Longer-term displacement is possible, however, which may lead to changes in abundance or distribution patterns of the affected species in the affected region if habituation to the presence of the sound does not occur (*e.g.,* Blackwell *et al.,* 2004; Bejder *et al.,* 2006; Teilmann *et al.*, 2006).

Forney *et al.* (2017) described the potential effects of noise on marine mammal populations with high site fidelity, including displacement and auditory masking. In cases of Western gray whales (Weller *et al.,* 2006) and beaked whales, anthropogenic effects in areas where they are resident or exhibit site fidelity could cause severe biological consequences, in part because displacement may adversely affect foraging rates, reproduction, or health, while an overriding instinct to remain in the area could lead to more severe acute effects. Avoidance of overlap between disturbing noise and areas and/or times of particular importance for sensitive species may be critical to avoiding population-level impacts because (particularly for animals with high site fidelity) there may be a strong motivation to remain in the area despite negative impacts.

A flight response is a dramatic change in normal movement to a directed and rapid movement away from the perceived location of a sound source. The flight response differs from other avoidance responses in the intensity of the response (*e.g.,* directed movement, rate of travel). Relatively little information on flight responses of marine mammals to anthropogenic signals exist, although observations of flight responses to the presence of predators have occurred (Connor and Heithaus, 1996). The result of a flight response could range from brief, temporary exertion and displacement from the area where the signal provokes flight to, in extreme cases, marine mammal strandings (Evans and England, 2001). There are limited data on flight response for marine mammals in water; however, there are examples of this response in species on land. For instance, the probability of flight responses in Dall's sheep *Ovis dalli dalli* (Frid, 2003), hauled-out ringed seals *Phoca hispida* (Born *et al.*, 1999), Pacific brant (*Branta bernicl nigricans*), and Canada geese (*B. canadensis*) increased as a helicopter or fixed-wing aircraft more directly approached groups of these animals (Ward *et al.*, 1999). However, it should be noted that response to a perceived predator does not necessarily invoke flight (Ford and

Reeves, 2008), and whether individuals are solitary or in groups may influence the response.

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al.,* 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a "progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial," rather than as, more generally, moderation in response to human disturbance (Bejder *et al.,* 2009). The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. As noted, behavioral state may affect the type of response. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al.,* 1995; NRC, 2003; Wartzok *et al.,* 2003). Controlled experiments with captive marine mammals have showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al.,* 1997; Finneran *et al.,* 2003). Observed responses of wild marine mammals to loud impulsive sound sources (typically seismic airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds, 2002; see also Richardson *et al.,* 1995; Nowacek *et al.,* 2007).

Data on hooded seals (*Cystophora cristata*) indicate avoidance responses to signals above 160-170 dB re 1 μPa (Kvadsheim *et al.,* 2010), and data on grey (*Halichoerus grypus*) and harbor seals indicate avoidance response at received levels of 135-144 dB re 1 μPa (Götz *et al.,* 2010). In each instance where food was available, which provided the seals motivation to remain near the source, habituation to the signals occurred rapidly. In the same study, it was noted that habituation was not apparent in wild seals where no food source was available (Götz *et al.,* 2010). This implies that the motivation of the animal is necessary to consider in determining the potential for a reaction. In one study to investigate the under-ice movements and sensory cues associated with under-ice navigation of ice seals, acoustic transmitters (60-69 kHz at 159 dB re 1 μPa at 1 m) were attached to ringed seals (Wartzok *et al.,* 1992a, Wartzok *et al.,* 1992b). An acoustic tracking system then was installed in the ice to receive the acoustic signals and provide real-time tracking of ice seal movements. Although the frequencies used in this study are at the upper limit of ringed seal hearing, the ringed seals appeared unaffected by the acoustic transmissions, as they were able to maintain normal behaviors (*e.g.,* finding breathing holes).

Behavioral disturbance can also impact marine mammals in more subtle ways. Increased vigilance may result in costs related to diversion of focus and attention (*i.e.,* when a response consists of increased vigilance, it may come at the cost of decreased attention to other critical behaviors such as foraging or resting). These effects have generally not been observed in marine mammals, but studies involving fish and terrestrial animals have shown that increased vigilance may substantially reduce feeding rates and efficiency (*e.g.,* Beauchamp and Livoreil, 1997; Fritz *et al.,* 2002; Purser and Radford, 2011). In addition, chronic disturbance can cause population declines through reduction of fitness (*e.g.,* decline in body condition) and subsequent reduction in reproductive success, survival, or both *(e.g.,* Harrington and Veitch, 1992; Daan *et al.,* 1996; Bradshaw *et al.,* 1998).

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Disruption of such functions resulting from reactions to stressors such as sound exposure are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.,* 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al.,* 2007). Note that there is a difference between multi-day substantive behavioral reactions and multi-day anthropogenic activities. For example, just because an activity lasts for multiple days does not necessarily mean that individual animals are either exposed to activity-related stressors for multiple days or, further, exposed in a manner resulting in sustained multi-day substantive behavioral responses.

Behavioral response studies have been conducted on odontocete responses to sonar. Sperm whales were exposed to pulsed active sonar (1–2 kHz) at moderate source levels and high source levels, as well as continuously active sonar at moderate levels for which the summed energy (SEL) equaled the summed energy of the high source level pulsed sonar (Isojunno *et al.*, 2020). Foraging behavior did not change during exposures to moderate source level sonar, but non-foraging behavior increased during exposures to high source level sonar and to the continuous sonar, indicating that the energy of the sound (the SEL) was a better predictor of response than SPL. Time of day of the exposure was also an important covariate in determining the amount of non-foraging behavior, as were order effects (*e.g.* the SEL of the previous exposure); Isojunno *et al.* (2021) found that higher SELs reduced sperm whale buzzing (*i.e*., foraging). Duration of continuous sonar activity also appears to impact sperm whale displacement and foraging activity (Stanistreet *et al.,* 2022). During long bouts of sonar lasting up to 13 consecutive hours, occurring repeatedly over an 8 day naval exercise (median and maximum SPL = 120 dB and 164 dB), sperm whales substantially reduced how often they produced clicks during sonar, indicating a decrease or cessation in foraging behavior. Curé *et al.* (2021) also found that sperm whales exposed to continuous and pulsed active sonar were more likely to produce low or medium severity responses with higher cumulative SEL. Specifically, the probability of observing a low severity response increased to 0.5 at approximately 173 dB SEL and observing a medium severity response reached a probability of 0.35 at cumulative SELs between 179 and 189 dB. These results again demonstrate that the behavioral state and environment of the animal mediates the likelihood of a behavioral response, as do the characteristics (*e.g.,* frequency, energy level) of the sound source itself.

Many of the contextual factors resulting from the behavioral response studies (*e.g.,* close approaches by multiple vessels or tagging) would not occur during the proposed action. Odontocete behavioral responses to acoustic transmissions from non-impulsive sources used during the proposed action would likely be a result of the animal's behavioral state and prior experience rather than external variables such as ship proximity; thus, any behavioral responses are expected to be minimal and short term.

To assess the strength of behavioral changes and responses to external sounds and SPLs associated with changes in behavior, Southall *et al.,* (2007) developed and utilized a severity scale, which is a 10 point scale ranging from no effect (labeled 0), effects not likely to influence vital rates (low; labeled from 1 to 3), effects that could affect vital rates (moderate; labeled 4 to 6), to effects that were thought likely to influence vital rates (high; labeled 7 to 9). Southall *et al.,* (2021) updated the severity scale by integrating behavioral context (*i.e.,* survival, reproduction, and foraging) into severity assessment. For non-impulsive sounds (*i.e.,* similar to the sources used during the proposed action), data suggest that exposures of pinnipeds to sources between 90 and 140 dB re 1 μPa do not elicit strong behavioral responses; no data were available for exposures at higher received levels for Southall *et al.,* (2007) to include in the severity scale analysis. Reactions of harbor seals were the only available data for which the responses could be ranked on the severity scale. For reactions that were recorded, the majority (17 of 18 individuals/groups) were ranked on the severity scale as a 4 (defined as moderate change in movement, brief shift in group distribution, or moderate change in vocal behavior) or lower; the remaining response was ranked as a 6 (defined as minor or moderate avoidance of the sound source).

Behavioral Responses to Ice Breaking Noise- Ringed seals on pack ice showed various behaviors when approached by an icebreaking vessel. A majority of seals dove underwater when the ship was within 0.5 nm (0.93 km) while others remained on the ice. However, as icebreaking vessels came closer to the seals, most dove underwater. Ringed seals have also been observed foraging in the wake of an icebreaking vessel (Richardson *et al.,* 1995). In studies by Alliston (1980; 1981), there was no observed change in the density of ringed seals in areas that had been subject to icebreaking. Alternatively, ringed seals may have preferentially established breathing holes in the ship tracks after the icebreaker moved through the area. Previous observations and studies using icebreaking ships provide a greater understanding in how seal behavior may be affected by a vessel transiting through the area.

Adult ringed seals spend up to 20 percent of the time in subnivean lairs during the winter season (Kelly *et al.,* 2010b). Ringed seal pups spend about 50 percent of their time in the lair during the nursing period (Lydersen and Hammill, 1993). During the warm season ringed seals haul out on the ice. In a study of ringed seal haul out activity by Born *et al.,* (2002), ringed seals spent 25-57 percent of their time hauled out in June, which is during their molting season. Ringed seal lairs are typically used by individual seals (haulout lairs) or by a mother with a pup (birthing lairs); large lairs used by many seals for hauling out are rare (Smith and Stirling, 1975). If the non-impulsive acoustic transmissions are heard and are perceived as a threat, ringed seals within subnivean lairs could react to the sound in a similar fashion to their reaction to other threats, such as polar bears (their primary predators), although the type of sound would be novel to them. Responses of ringed seals to a variety of human-induced sounds (*e.g.,* helicopter noise, snowmobiles, dogs, people, and seismic activity) have been variable; some seals entered the water and some seals remained in the lair. However, in all instances in which observed seals departed lairs in response to noise disturbance, they subsequently reoccupied the lair (Kelly *et al.,* 1988d).

Ringed seal mothers have a strong bond with their pups and may physically move their pups from the birth lair to an alternate lair to avoid predation, sometimes risking their lives to defend their pups from potential predators (Smith, 1987). If a ringed seal mother perceives the proposed acoustic sources as a threat, the network of multiple birth and haulout lairs allows the mother and pup to move to a new lair (Smith and Hammill, 1981; Smith and Stirling, 1975). The acoustic sources from this proposed action are not likely to impede a ringed seal from finding a breathing hole or lair, as captive seals have been found to primarily use vision to locate breathing holes and no effect to ringed seal vision would occur from the acoustic disturbance (Elsner *et al.,* 1989; Wartzok *et al.,* 1992a). It is anticipated that a ringed seal would be able to relocate to a different breathing hole relatively easily without impacting their normal behavior patterns.

Stress responses— An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.,* Seyle, 1950; Moberg, 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress—including immune competence, reproduction, metabolism, and behavior—are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.,* Moberg, 1987; Blecha, 2000).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and "distress" is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well studied through controlled experiments and for both laboratory and free-ranging animals (*e.g.,* Holberton *et al.,* 1996; Hood *et al.,* 1998; Jessop *et al.,* 2003; Krausman *et al.,* 2004; Lankford *et al.,* 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker, 2000; Romano *et al.,* 2002b) and, more rarely, studied in wild populations (*e.g.,* Romano *et al.,* 2002a). These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress." In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003).

Auditory masking— Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.,* those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al.,* 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.,* snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.,* shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.,* signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.,* sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions.

Under certain circumstances, marine mammals experiencing significant masking could also be impaired from maximizing their performance fitness in survival and reproduction. Therefore, when the coincident (masking) sound is anthropogenic, it may be considered harassment when disrupting or significantly altering behavior patterns. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure. Because masking (without resulting in TS) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. For example, low-frequency signals may have less effect on high-frequency echolocation sounds produced by odontocetes but are more likely to affect detection of mysticete communication calls and other potentially important natural sounds such as those produced by surf and some prey species. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g.,* Clark *et al.,* 2009) and may result in energetic or other costs as animals change their vocalization behavior (*e.g.,* Miller *et al.,* 2000; Foote *et al.,* 2004; Parks *et al.,* 2007; Di Iorio and Clark, 2009; Holt *et al.,* 2009). Masking can be reduced in situations where the signal and noise come from different directions (Richardson *et al.,* 1995), through amplitude modulation of the signal, or through other compensatory behaviors (Houser and Moore, 2014). Masking can be tested directly in captive species (*e.g.,* Erbe, 2008), but in wild populations it must be either modeled or inferred from evidence of masking compensation. There are few studies addressing real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g.,* Branstetter *et al.,* 2013).

Masking affects both senders and receivers of acoustic signals and can potentially have long-term chronic effects on marine mammals at the population level as well as at the individual level. Low-frequency ambient sound levels have increased by as much as 20 dB (more than three times in terms of SPL) in the world's ocean from pre-industrial periods, with most of the increase from distant commercial shipping (Hildebrand, 2009). All anthropogenic sound sources, but especially chronic and lower-frequency signals (*e.g.,* from vessel traffic), contribute to elevated ambient sound levels, thus intensifying masking. Due to the transient nature of marine mammals to move and avoid disturbance, masking is not likely to have long-term impacts on marine mammal species within the proposed study area.

Potential Effects on Prey— The marine mammal species in the study area feed on marine invertebrates and fish. Studies of sound energy effects on invertebrates are few, and primarily identify behavioral responses. It is expected that most marine invertebrates would not sense the frequencies of the acoustic transmissions from the acoustic sources associated with the proposed action. Although acoustic sources used during the proposed action may briefly impact individuals, intermittent exposures to non-impulsive acoustic sources are not expected to impact survival, growth, recruitment, or reproduction of widespread marine invertebrate populations.

The fish species residing in the study area include those that are closely associated with the deep ocean habitat of the Beaufort Sea. Nearly 250 marine fish species have been described in the Arctic, excluding the larger parts of the sub-Arctic Bering, Barents, and Norwegian Seas (Mecklenburg *et al.,* 2011). However, only about 30 are known to occur in the Arctic waters of the Beaufort Sea (Christiansen and Reist, 2013). Although hearing capability data only exist for fewer than 100 of the 32,000 named fish species, current data suggest that most species of fish detect sounds from 50 to 100 Hz, with few fish hearing sounds above 4 kHz (Popper, 2008). It is believed that most fish have the best hearing sensitivity from 100 to 400 Hz (Popper, 2003). Fish species in the study area are expected to hear the low-frequency sources associated with the proposed action, but most are not expected to detect sound from the mid-frequency sources. Human generated sound could alter the behavior of a fish in a manner than would affect its way of living, such as where it tries to locate food or how well it could find a mate. Behavioral responses to loud noise could include a startle response, such as the fish swimming away from the source, the fish "freezing" and staying in place, or scattering (Popper, 2003). Misund (1997) found that fish ahead of a ship showed avoidance reactions at ranges of 160 to 489 ft (49 to 149 m). Avoidance behavior of vessels, vertically or horizontally in the water column, has been reported for cod and herring, and was attributed to vessel noise. While acoustic sources associated with the proposed action may influence the behavior of some fish species, other fish species may be equally unresponsive. Overall effects to fish from the proposed action would be localized, temporary, and infrequent.

Effects to Physical and Foraging Habitat— Ringed seals haul out on pack ice during the spring and summer to molt (Reeves *et al.,* 2002; Born *et al.,* 2002). Additionally, some studies (Alliston, 1980; 1981) suggested that ringed seals might preferentially establish breathing holes in ship tracks after vessels move through the area. The amount of ice habitat disturbed by activities is small relative to the amount of overall habitat available and there will be no permanent or longer-term loss or modification of physical ice habitat used by ringed seals. Vessel movement would have minimal effect on physical beluga habitat as beluga habitat is solely within the water column. Furthermore, the deployed sources that would remain in use after the vessels have left the survey area have low duty cycles and lower source levels, and any impacts to the acoustic habitat of marine mammals would be minimal.

Estimated Take

This section provides an estimate of the number of incidental takes proposed for authorization through this IHA, which will inform both NMFS' consideration of "small numbers" and the negligible impact determinations.

Harassment is the only type of take expected to result from these activities. For this military readiness activity, the MMPA defines "harassment" as (i) Any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) Any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where the behavioral patterns are abandoned or significantly altered (Level B harassment).

Authorized takes would be by Level B harassment only, in the form of disruption of behavioral patterns and/or TTS for individual marine mammals resulting from exposure to ONR's acoustic sources. Based on the nature of the activity, Level A harassment is neither anticipated nor proposed to be authorized.

As described previously, no serious injury or mortality is anticipated or proposed to be authorized for this activity. Below we describe how the proposed take numbers are estimated.

For acoustic impacts, generally speaking, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) the number of days of activities. We note that while these factors can contribute to a basic calculation to provide an initial prediction of potential takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.,* previous monitoring results or average group size). For the proposed IHA, ONR employed an advanced model known as the Navy Acoustic Effects Model (NAEMO) for assessing the impacts of underwater sound. Below, we describe the factors considered here in more detail and present the proposed take estimates.

Acoustic Thresholds

NMFS recommends the use of acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source or exposure context (*e.g.*, frequency, predictability, duty cycle, duration of the exposure, signal-to-noise ratio, distance to the source), the environment (*e.g.*, bathymetry, other noises in the area, predators in the area), and the receiving animals (hearing, motivation, experience, demography, life stage, depth) and can be difficult to predict (*e.g.*, Southall *et al.,* 2007, 2021, Ellison *et al.*, 2012). Based on what the available science indicates and the practical need to use a threshold based on a metric that is both predictable and measurable for most activities, NMFS typically uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS generally predicts that marine mammals are likely to be behaviorally harassed in a manner considered to be Level B harassment when exposed to underwater anthropogenic noise above root-mean-squared pressure received levels (RMS SPL) of 120 dB (referenced to 1 micropascal (re 1 μPa)) for continuous (*e.g.,* vibratory pile-driving, drilling) and above RMS SPL 160 dB re 1 μPa (rms) for non-explosive impulsive (*e.g.*, seismic airguns) or intermittent (*e.g.*, scientific sonar) sources.

In this case, NMFS is proposing to adopt the Navy's approach to estimating incidental take by Level B harassment from the active acoustic sources for this action, which includes use of dose response functions. The Navy's dose response functions were developed to estimate take from sonar and similar transducers, but are not applicable to ice breaking. Multi-year research efforts have conducted sonar exposure studies for odontocetes and mysticetes (Miller *et al.,* 2012; Sivle *et al.,* 2012). Several studies with captive animals have provided data under controlled circumstances for odontocetes and pinnipeds (Houser *et al.,* 2013a; Houser *et al.,* 2013b). Moretti *et al.,* (2014) published a beaked whale dose-response curve based on passive acoustic monitoring of beaked whales during U.S. Navy training activity at Atlantic Underwater Test and Evaluation Center during actual Anti-Submarine Warfare exercises. This information necessitated the update of the behavioral response criteria for the U.S. Navy's environmental analyses.

Southall *et al.,* (2007), and more recently Southall *et al.,* (2019), synthesized data from many past behavioral studies and observations to determine the likelihood of behavioral reactions at specific sound levels. While in general, the louder the sound source the more intense the behavioral response, it was clear that the proximity of a sound source and the animal's experience, motivation, and conditioning were also critical factors influencing the response (Southall *et al.,* 2007; Southall *et al.,* 2019). After examining all of the available data, the authors felt that the derivation of thresholds for behavioral response based solely on exposure level was not supported because context of the animal at the time of sound exposure was an important factor in estimating response.

Nonetheless, in some conditions, consistent avoidance reactions were noted at higher sound levels depending on the marine mammal species or group allowing conclusions to be drawn. Phocid seals showed avoidance reactions at or below 190 dB re 1 μPa at 1m; thus, seals may actually receive levels adequate to produce TTS before avoiding the source.

Odontocete behavioral criteria for non-impulsive sources were updated based on controlled exposure studies for dolphins and sea mammals, sonar, and safety (3S) studies where odontocete behavioral responses were reported after exposure to sonar (Antunes *et al.,* 2014; Houser *et al.,* 2013b; Miller *et al.,* 2011; Miller *et al.,* 2014; Miller *et al.,* 2012). For the 3S study, the sonar outputs included 1-2 kHz up- and down-sweeps and 6-7 kHz up-sweeps; source levels were ramped up from 152-158 dB re 1 μPa to a maximum of 198-214 re 1 μPa at 1 m. Sonar signals were ramped up over several pings while the vessel approached the mammals. The study did include some control passes of ships with the sonar off to discern the behavioral responses of the mammals to vessel presence alone versus active sonar.

The controlled exposure studies included exposing the Navy's trained bottlenose dolphins to mid-frequency sonar while they were in a pen. Mid-frequency sonar was played at 6 different exposure levels from 125-185 dB re 1 μPa (rms). The behavioral response function for odontocetes resulting from the studies described above has a 50 percent probability of response at 157 dB re 1 μPa. Additionally, distance cutoffs (20 km for MF cetaceans) were applied to exclude exposures beyond which the potential of significant behavioral responses is considered to be unlikely.

The pinniped behavioral threshold was updated based on controlled exposure experiments on the following captive animals: hooded seal, gray seal (*Halichoerus grypus*), and California sea lion (Götz *et al.,* 2010; Houser *et al.,* 2013a; Kvadsheim *et al.,* 2010). Hooded seals were exposed to increasing levels of sonar until an avoidance response was observed, while the grey seals were exposed first to a single received level multiple times, then an increasing received level. Each individual California sea lion was exposed to the same received level ten times. These exposure sessions were combined into a single response value, with an overall response assumed if an animal responded in any single session. The resulting behavioral response function for pinnipeds has a 50 percent probability of response at 166 dB re 1 μPa. Additionally, distance cutoffs (10 km for pinnipeds) were applied to exclude exposures beyond which the potential of significant behavioral responses is considered unlikely. For additional information regarding marine mammal thresholds for PTS and TTS onset, please see NMFS (2018) and Table 6.

Empirical evidence has not shown responses to non-impulsive acoustic sources that would constitute take beyond a few km from a non-impulsive acoustic source, which is why NMFS and the Navy conservatively set distance cutoffs for pinnipeds and mid-frequency cetaceans (U.S. Department of the Navy, 2017a). The cutoff distances for fixed sources are different from those for moving sources, as they are treated as individual sources in Navy modeling given that the distance between them is significantly greater than the range to which environmental effects can occur. Fixed source cutoff distances used were 2.7 nm (5 km) for pinnipeds and 5.4 nm (10 km) for beluga whales (Table 5). As some of the on-site drifting sources could come closer together, the drifting source cutoffs applied were 5.4 nm (10 km) for pinnipeds and 10.8 nm (20 km) for beluga whales (Table 5). Regardless of the received level at that distance, take is not estimated to occur beyond these cutoff distances. Range to thresholds were calculated for the noise associated with icebreaking in the study area. These all fall within the same cutoff distances as non-impulsive acoustic sources; range to behavioral threshold for both beluga whales and ringed seal were under 2.7 nm (5 km), and range to TTS threshold for both under 15 m (Table 5).

Table 5. Thresholds[1] and Cutoff Distances for Sources by Species

Species	Behavioral threshold for non-impulsive acoustic sources	Fixed Source Behavioral Threshold Cutoff Distance[3] (km)	Drifting Source Behavioral Threshold Cutoff Distance [3] (km)	Behavioral threshold for ice breaking sources	Ice Breaking Source Cutoff Distance [3] (km)	TTS Threshold	PTS Threshold
Ringed Seal	Pinniped Dose Response Function[2]	5	10	120 dB re 1 µPa step function	<5	181 dB SEL cumulative	201 dB SEL cumulative
Beluga Whale	Mid-Frequency BRF dose Response Function[2]	10	20	120 dB re 1 µPa step function	<15	178 dB SEL cumulative	198 dB SEL cumulative

1 - The threshold values provided are assumed for when the source is within the animal's best hearing sensitivity. The exact threshold varies based on the overlap of the source and the frequency weighting
2 - See Figure 6-1 in application
3 - Take is not estimated to occur beyond these cutoff distances, regardless of the received level.

Level A harassment – NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). ONR's proposed activity includes the use of non-impulsive acoustic sources; however, Level A harassment is not expected as a result of the proposed activities nor is it proposed to be authorized by NMFS.

These thresholds are provided in the table below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS' 2018 Technical Guidance, which may be accessed at: *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance*.

Table 6. Thresholds Identifying the Onset of Permanent Threshold Shift

	PTS Onset Thresholds* (Received Level)	
Hearing Group	Impulsive	Non-impulsive

Low-Frequency (LF) Cetaceans	*Cell 1* $L_{p,\text{0-pk,flat}}$: 219 dB $L_{\text{E},p,\text{ LF,24h}}$: 183 dB	*Cell 2* $L_{\text{E},p,\text{ LF,24h}}$: 199 dB
Mid-Frequency (MF) Cetaceans	*Cell 3* $L_{p,\text{0-pk,flat}}$: 230 dB $L_{\text{E},p,\text{ MF,24h}}$: 185 dB	*Cell 4* $L_{\text{E},p,\text{ MF,24h}}$: 198 dB
High-Frequency (HF) Cetaceans	*Cell 5* $L_{p,\text{0-pk,flat}}$: 202 dB $L_{\text{E},p,\text{HF,24h}}$: 155 dB	*Cell 6* $L_{\text{E},p,\text{ HF,24h}}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	*Cell 7* $L_{p,\text{0-pk.flat}}$: 218 dB $L_{\text{E},p,\text{PW,24h}}$: 185 dB	*Cell 8* $L_{\text{E},p,\text{PW,24h}}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	*Cell 9* $L_{p,\text{0-pk,flat}}$: 232 dB $L_{\text{E},p,\text{OW,24h}}$: 203 dB	*Cell 10* $L_{\text{E},p,\text{OW,24h}}$: 219 dB

* Dual metric thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds are recommended for consideration.

Note: Peak sound pressure level ($L_{p,\text{0-pk}}$) has a reference value of 1 μPa, and weighted cumulative sound exposure level ($L_{\text{E},p}$) has a reference value of 1μPa^{2}s. In this Table, thresholds are abbreviated to be more reflective of International Organization for Standardization standards (ISO 2017). The subscript "flat" is being included to indicate peak sound pressure are flat weighted or unweighted within the generalized hearing range of marine mammals (*i.e.*, 7 Hz to 160 kHz). The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The weighted cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.*, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these thresholds will be exceeded.

Quantitative Modeling

The Navy performed a quantitative analysis to estimate the number of marine mammals likely to be exposed to underwater acoustic transmissions above the previously described threshold criteria during the proposed action. Inputs to the quantitative analysis included marine mammal density estimates obtained from the Kaschner *et al.* (2006) habitat suitability model and Cañadas *et al.* (2020), marine mammal depth occurrence (U.S. Department of the Navy, 2017b), oceanographic and mammal hearing data, and criteria and thresholds for levels of potential effects. The quantitative analysis consists of computer modeled estimates and a post-model analysis to determine the number of potential animal exposures. The model calculates sound energy propagation from the proposed non-impulsive acoustic sources, the sound received by animat (virtual animal) dosimeters representing marine mammals distributed in the area around the modeled activity, and whether the sound received by animats exceeds the thresholds for effects.

The Navy developed a set of software tools and compiled data for estimating acoustic effects on marine mammals without consideration of behavioral avoidance or mitigation. These tools and data sets serve as integral components of the Navy Acoustic Effects Model (NAEMO). In NAEMO, animats are distributed non-uniformly based on species-specific density, depth distribution, and group size information and animats record energy received at their location in the water column. A fully three-dimensional environment is used for calculating sound propagation and animat exposure in NAEMO. Site-specific bathymetry, sound speed profiles, wind speed, and bottom properties are incorporated into the propagation modeling process. NAEMO calculates the likely propagation for various levels of energy (sound or pressure) resulting from each source used during the training event.

NAEMO then records the energy received by each animat within the energy footprint of the event and calculates the number of animats having received levels of energy exposures that fall within defined impact thresholds. Predicted effects on the animats within a scenario are then tallied and the highest order effect (based on severity of criteria; *e.g.,* PTS over TTS) predicted for a given animat is assumed. Each scenario, or each 24-hour period for scenarios lasting greater than 24 hours is independent of all others, and therefore, the same individual marine mammal (as represented by an animat in the model environment) could be impacted during each independent scenario or 24-hour period. In few instances, although the activities themselves all occur within the proposed study location, sound may propagate beyond the boundary of the study area. Any exposures occurring outside the boundary of the study area are counted as if they occurred within the study area boundary. NAEMO provides the initial estimated impacts on marine species with a static horizontal distribution (*i.e.,* animats in the model environment do not move horizontally).

There are limitations to the data used in the acoustic effects model, and the results must be interpreted within this context. While the best available data and appropriate input assumptions have been used in the modeling, when there is a lack of definitive data to support an aspect of the modeling, conservative modeling assumptions have been chosen (*i.e.,* assumptions that may result in an overestimate of acoustic exposures):

- Animats are modeled as being underwater, stationary, and facing the source and therefore always predicted to receive the maximum potential sound level at a given location (*i.e.,* no porpoising or pinnipeds' heads above water);
- Animats do not move horizontally (but change their position vertically within the water column), which may overestimate physiological effects such as hearing loss, especially for slow moving or stationary sound sources in the model;
- Animats are stationary horizontally and therefore do not avoid the sound source, unlike in the wild where animals would most often avoid exposures at higher sound levels, especially those exposures that may result in PTS;
- Multiple exposures within any 24-hour period are considered one continuous exposure for the purposes of calculating potential threshold shift, because there are not sufficient data to estimate a hearing recovery function for the time between exposures; and
- Mitigation measures were not considered in the model. In reality, sound-producing activities would be reduced, stopped, or delayed if marine mammals are detected by visual monitoring.

Due to these inherent model limitations and simplifications, model-estimated results should be further analyzed, considering such factors as the range to specific effects, avoidance, and the likelihood of successfully implementing mitigation measures.

This analysis uses a number of factors in addition to the acoustic model results to predict acoustic effects on marine mammals, as described below in the **Marine Mammal Occurrence and Take Estimation** section.

The underwater radiated noise signature for icebreaking in the central Arctic Ocean by CGC Healy during different types of ice-cover was characterized in Roth *et al.* (2013). The radiated noise signatures were characterized for various fractions of ice cover. For modeling, the 8/10 and 3/10 ice cover were used. Each modeled day of icebreaking consisted of 16 hours of 8/10 ice cover and 8 hours of 3/10 ice cover. The sound signature of the 5/10 icebreaking activities, which would correspond to half-power icebreaking, was not reported in (Roth et al. 2013); therefore, the full-power signature was used as a conservative proxy for the half-power signature. Icebreaking was modeled for eight days total. Since ice forecasting cannot be predicted more than a few weeks in advance, it is unknown if icebreaking would be needed to deploy or retrieve the sources after one year of transmitting. Therefore, the potential for an icebreaking cruise on CGC Healy was conservatively analyzed within this request for an IHA. As the R/V *Sikuliaq* is not expected to be ice breaking, acoustic noise created by ice breaking is only modeled for the CGC Healy. Figures 5a and 5b in Roth *et al.* (2013) depict the source spectrum level versus frequency for 8/10 and 3/10 ice cover, respectively. The sound signature of each of the ice coverage levels was broken into 1-octave bins (Table 7). In the model, each bin was included as a separate source on the modeled vessel. When these independent sources go active concurrently, they simulate the sound signature of CGC Healy. The modeled source level summed across these bins was 196.2 dB for the 8/10 signature and 189.3 dB for the 3/10 ice signature. These source levels are a good approximation of the icebreaker's observed source level (provided in Figure 4b of (Roth *et al.,* 2013)). Each frequency and source level was modeled as an independent source, and applied simultaneously to all of the animats within NAEMO. Each second was summed across frequency to estimate sound pressure level (root mean square [SPL_{RMS}]). Any animat exposed to sound levels greater than 120 dB was considered a take by Level B harassment. For PTS and TTS, determinations, sound exposure levels were summed over the duration of the test and the transit to the deep water deployment area. The method of quantitative modeling for icebreaking is considered to be a conservative approach; therefore, the number of takes estimated for icebreaking are likely an overestimate and would not be expected to reach that level.

Table 7. Modeled Bins for 8/10 (full power) and 3/10 (quarter power) ice coverage ice breaking on the CGC Healy

Frequency (Hz)	8/10 Source Level (dB)	3/10 Source Level (dB)
25	189	187
50	188	182
100	189	179
200	190	177
400	188	175
800	183	170
1600	177	166
3200	176	171
6400	172	168
12800	167	164

For non-impulsive sources, NAEMO calculates the SPL and SEL for each active emission during an event. This is done by taking the following factors into account over the propagation paths: bathymetric relief and bottom types, sound speed, and attenuation contributors such as absorption, bottom loss, and surface loss. Platforms such as a ship using one or more sound sources are modeled in accordance with relevant vehicle dynamics and time durations by moving them across an area whose size is representative of the testing event's operational area.

Marine Mammal Occurrence and Take Estimation

In this section we provide information about the occurrence of marine mammals, including density or other relevant information that will inform the take calculations. We also describe how the marine mammal occurrence information is synthesized to produce a quantitative estimate of the take that is reasonably likely to occur and proposed for authorization.

The beluga whale density numbers utilized for quantitative acoustic modeling are from the Navy Marine Species Density Database (U.S. Department of the Navy 2014). Where available (*i.e.,* June through 15 October over the continental shelf primarily), density estimates used were from Duke density modeling based upon line-transect surveys (Cañadas *et al.,* 2020). The remaining seasons and geographic area were based on the habitat-based modeling by Kaschner *et al.* (2006) and Kaschner (2004). Density for beluga whales was not distinguished by stock and varied throughout the project area geographically and monthly; the range of densities in the project area during September I shown in Table 8. The density estimates for ringed seals are based on the habitat suitability modeling by Kaschner *et al.,* (2006) and Kaschner (2004) and shown in Table 8 as well.

Table 8. Density estimates of impacted species

Common Name	Density Estimates (animals/km^2)
Beluga whale (Beaufort Sea) Stock	0.000506 to 0.5176
Beluga whale (Eastern Chukchi Sea Stock)	
Ringed seal (Arctic Stock)	0.1108 to 0.3562

Take of all species would occur by Level B harassment only. NAEMO estimated for potential TTS exposure and predicted one exposure of ringed seals may occur as a result of the proposed activities. Table 9 shows the total number of requested takes by Level B harassment that NMFS proposes to authorize for both beluga whale stocks and the Arctic ringed seal stock based upon NAEMO modeled results.

Density estimates for beluga whales are equal as estimates were not distinguished by stock (Kaschner *et al.,* 2006; Kaschner, 2004). The ranges of the Beaufort Sea and Eastern Chukchi Sea beluga whales vary within the study area throughout the year

(Hauser *et al.,* 2014). Based upon the limited information available regarding the expected spatial distributions of each stock within the study area, take has been apportioned equally to each stock (Table 9). In addition, in NAEMO, animats do not move horizontally or react in any way to avoid sound. Therefore, the current model may overestimate non-impulsive acoustic impacts.

Table 9. Requested take by Level B harassment

Species	Non-Impulsive Active Acoustics (Behavioral)	Icebreaking (Behavioral)	Icebreaking (TTS)	Total Proposed Authorized Take	Percentage of Stock Requested for Take[1]
				Behavioral/TTS	
Beluga whale – Beaufort Sea Stock	134	11	0	145/0	0.369
Beluga whale – Eastern Chukchi Sea Stock	134	11	0	145/0	1.09
Ringed seal	2,839	538	1	3,377/1	1.97

[1] Percentage of stock taken calculated based on proportion of number of Level B takes per the stock population estimate provided in Table 3-1 in the application.

Proposed Mitigation

In order to issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses. NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, and their habitat (50 CFR 216.104(a)(11)). The NDAA for FY 2004 amended the MMPA as it relates to military readiness activities and the incidental take authorization process such that "least practicable impact" shall include consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, NMFS considers two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat, as well as subsistence uses. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned), the likelihood of effective implementation (probability implemented as planned), and;

(2) The practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

Mitigation for Marine Mammals and their Habitat

The Navy would be required to abide by the mitigation measures below. These measures are expected to: further minimize the likelihood of ship strikes; reduce the likelihood that marine mammals are exposed to sound levels during acoustic source deployment that would be expected to result in TTS or more severe behavioral responses and also to ensure that there are no other interactions between the deployed gear and marine mammals, and; further ensure that there are no impacts to subsistence uses.

Ships operated by or for the Navy have at least one personnel assigned to stand watch at all times, day and night, when moving through the water. Watch personnel must be trained through the U.S. Navy Marine Species Awareness Training Program, which standardizes watch protocols and trains personnel in marine species detection to prevent adverse impacts to marine mammal species. While in transit, ships must be alert at all times, use extreme caution and proceed at a safe speed such that the ship can take proper and effective action to avoid a collision with any marine mammals.

During mooring or UUV deployment, visual observation would start 15 minutes prior to and continue throughout the deployment within the mitigation zone of 180 ft (55 m, roughly one ship length) around the deployed mooring. Deployment will stop if a marine mammal is visually detected within the exclusion zone. Deployment will re-commence if any one of the following conditions are met: (1) The animal is observed exiting the exclusion zone, (2) the animal is thought to have exited the exclusion zone based on its course and speed, or (3) the exclusion zone has been clear from any additional sightings for a period of 15 minutes for pinnipeds and 30 minutes for cetaceans.

Ships would avoid approaching marine mammals head-on and would maneuver to maintain a mitigation zone of 500 yards (yd; 457 m) around observed cetaceans, and 200 yd (183 m) around all other marine mammals, provided it is safe to do so in ice-free waters. Ships captains and subsistence whalers would also maintain at-sea communication to avoid conflict of ship transit with hunting activity.

If a marine mammal species for which take is not authorized is encountered or observed within the mitigation zone, or a species for which authorization was granted but the authorized number of takes have been met, activities must cease. Activities may not resume until the animal is confirmed to have left the area.

These requirements do not apply if a vessel's safety is at risk, such as when a change of course would create an imminent and serious threat to safety, person, or vessel, and to the extent that vessels are restricted in their ability to maneuver. No further action is necessary if a marine mammal other than a cetacean continues to approach the vessel after there has already been one maneuver and/or speed change to avoid the animal.

Avoidance measures should continue for any observed cetacean in order to maintain a mitigation zone of 500 yd (457 m).

Based on our evaluation of the applicant's proposed measures, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for subsistence uses.

Proposed Monitoring and Reporting

In order to issue an IHA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present while conducting the activities. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

● Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);

● Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);

- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and,
- Mitigation and monitoring effectiveness.

While underway, the ships (including non-Navy ships operating on behalf of the Navy) utilizing active acoustics will have at least one watch person during activities. Watch personnel must undertake extensive training through the Navy's Marine Species Awareness Training. Their duties may be performed in conjunction with other job responsibilities, such as navigating the ship or supervising other personnel. While on watch, personnel employ visual search techniques, including the use of binoculars, using a scanning method in accordance with the U.S. Navy Marine Species Awareness Training or civilian equivalent. A primary duty of watch personnel is to detect and report all objects and disturbances sighted in the water that may be indicative of a threat to the ship and its crew, such as debris, or surface disturbance. Per safety requirements, watch personnel also report any marine mammals sighted that have the potential to be in the direct path of the ship as a standard collision avoidance procedure.

While underway, the ships (including non-Navy ships operating on behalf of the Navy) utilizing active acoustics and towed in-water devices will have at least one watch person during activities. While underway, watch personnel must be alert at all times and have access to binoculars. Each day, the following information should be recorded:

- Vessel name;
- Watch personnel names and affiliations;
- Effort type (*i.e.,* transit or deployment); and
- Environmental conditions (at the beginning of watch personnel shift and whenever conditions changed significantly), including Beaufort Sea State and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon.

Watch personnel must use standardized data collection forms, whether electronic or hard copy, as well as distinguish between marine mammal sightings that occur during ship transit or acoustic source deployment. Upon visual observation of a marine mammal, the following information would be recorded:

- Date/time of sighting;
- Identification of animal (e.g., genus/species, lowest possible taxonomic level, or unidentified) and the composition of the group if there is a mix of species;
- Location (latitude/longitude) of sighting;
- Estimated number of animals (high/low/best)
- Description (as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);
- Detailed behavior observations (e.g., number of blows/breaths, number of surfaces, breaching, spyhopping, diving, feeding, traveling; as explicit and detailed as possible; length of time the animal was observed within the harassment zone; note any observed changes in behavior);

- Distance from ship to animal;
- Direction of animal's travel relative to the vessel
- Platform activity at time of sighting (*i.e.,* transit, deployment); and
- Weather conditions (*i.e.,* Beaufort Sea State, cloud cover).

The U.S. Navy has coordinated with NMFS to develop an overarching program plan in which specific monitoring would occur. This plan is called the Integrated Comprehensive Monitoring Program (ICMP) (Department of the Navy, 2011). The ICMP has been developed in direct response to Navy permitting requirements established through various environmental compliance efforts. As a framework document, the ICMP applies by regulation to those activities on ranges and operating areas for which the Navy is seeking or has sought incidental take authorizations. The ICMP is intended to coordinate monitoring efforts across all regions and to allocate the most appropriate level and type of effort based on a set of standardized research goals, and in acknowledgement of regional scientific value and resource availability.

The ICMP is focused on Navy training and testing ranges where the majority of Navy activities occur regularly as those areas have the greatest potential for being impacted. ONR's ARA in comparison is a less intensive test with little human activity present in the Arctic. Human presence is limited to the deployment of sources that would take place over several weeks. Additionally, due to the location and nature of the testing, vessels and personnel would not be within the study area for an extended period of time. As such, more extensive monitoring requirements beyond the basic information being collected would not be feasible as it would require additional personnel and equipment to locate seals and a presence in the Arctic during a period of time other then what is planned for source deployment. However, ONR will record all observations of marine mammals, including the marine mammal's species identification, location (latitude and longitude), behavior, and distance from project activities. ONR will also record date and time of sighting. This information is valuable in an area with few recorded observations.

If any injury or death of a marine mammal is observed during the 2022-2023 ARA, the Navy will immediately halt the activity and report the incident to the Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator, NMFS. The following information must be provided:

- Time, date, and location of the discovery;
- Species identification (if known) or description of the animal(s) involved;
- Condition of the animal(s) (including carcass condition if the animal is dead);
- Observed behaviors of the animal(s), if alive;
- If available, photographs or video footage of the animal(s); and
- General circumstances under which the animal(s) was discovered (*e.g.,* deployment of moored or drifting sources or by transiting vessel).

ONR will provide NMFS OPR and AKR with a draft monitoring report within 90 days of the conclusion of each research cruise, or sixty days prior to the issuance of any subsequent IHA for this project, whichever comes first. The draft monitoring report will include data regarding acoustic source use and any mammal sightings or detection documented. The report will include the estimated number of marine mammals taken during the activity. The report will also include information on the number of shutdowns recorded. If no comments are received from NMFS within 30 days of submission of the draft final report, the draft final report will constitute the final report. If comments are received, a final report must be submitted within 30 days after receipt of comments.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through harassment, NMFS considers other factors, such as the likely nature of any impacts or responses (*e.g.*, intensity, duration), the context of any impacts or responses (*e.g.*, critical reproductive time or location, foraging impacts affecting energetics), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS' implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

To avoid repetition, the discussion of our analysis applies to beluga whales and ringed seals, given that the anticipated effects of this activity on these different marine mammal stocks are expected to be similar. Where there are meaningful differences between species or stocks, or groups of species, in anticipated individual responses to activities, impact of expected take on the population due to differences in population status, or impacts on habitat, they are described independently in the analysis below.

Underwater acoustic transmissions associated with the proposed ARA, as outlined previously, have the potential to result in Level B harassment of beluga seals and ringed seals in the form of behavioral disturbances. No serious injury, mortality, or Level A harassment are anticipated to result from these described activities. Effects on individual belugas or ringed seals taken by Level B harassment could include alteration of dive behavior and/or foraging behavior, effects to breathing rates, interference with or alteration of vocalization, avoidance, and flight. More severe behavioral responses are not anticipated due to the localized, intermittent use of active acoustic sources. However, exposure duration is likely to be short-term and individuals will, most likely, simply be temporarily displaced by moving away from the acoustic source. Exposures are, therefore, unlikely to result in any significant realized decrease in fitness for affected individuals or adverse impacts to stocks as a whole.

Arctic ringed seals are listed as threatened under the ESA. The primary concern for Arctic ringed seals is the ongoing and anticipated loss of sea ice and snow cover resulting from climate change, which is expected to pose a significant threat to ringed seals in the future (Muto *et al.*, 2021). In addition, Arctic ringed seals have also been experiencing a UME since 2019 although the cause of the UME is currently undetermined. As mentioned earlier, no mortality or serious injury to ringed seals is anticipated nor proposed to be authorized. Due to the short-term duration of expected exposures and required mitigation measures to reduce adverse impacts, we do not expect the proposed ARA to affect annual rates of ringed seal survival and recruitment that may threaten population recovery or exacerbate the ongoing UME.

A small portion of the proposed ARA study area overlaps with ringed seal critical habitat. Although this habitat contains features necessary for ringed seal formation and maintenance of subnivean birth lairs, basking and molting, and foraging, these features are also available throughout the rest of the designated critical habitat area. Displacement of ringed seals from the proposed ARA study area would likely not interfere with their ability to access necessary habitat features. Therefore, we expect minimal impacts to any displaced ringed seals as similar necessary habitat features would still be available nearby.

The proposed ARA study area also overlaps with a beluga whale migratory BIA. Due to the small amount of overlap between the BIA and the proposed ARA study area as well as the low intensity and short-term duration of acoustic sources and required mitigation measures, we expect minimal impacts to migrating belugas. Shutdown zones will reduce the potential for Level A harassment of belugas and ringed seals, as well as the severity of any Level B harassment. The requirements of trained dedicated watch personnel and speed restrictions will also reduce the likelihood of any ship strikes to migrating belugas.

In all, the proposed ARA are expected to have minimal adverse effects on marine mammal habitat. While the activities may cause some fish to leave the area of disturbance, temporarily impacting marine mammals' foraging opportunities, this would encompass a relatively small area of habitat leaving large areas of existing fish and marine mammal foraging habitat unaffected. As such, the impacts to marine mammal habitat are not expected to impact the health or fitness of any marine mammals.

In summary and as described above, the following factors primarily support our preliminary determination that the impacts resulting from this activity are not expected to adversely affect any of the species or stocks through effects on annual rates of recruitment or survival:

- No serious injury or mortality is anticipated or authorized;
- Impacts would be limited to Level B harassment only;
- Only temporary behavioral modifications are expected to result from these proposed activities;
- Impacts to marine mammal prey or habitat will be minimal and short term.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from the proposed activity will have a negligible impact on all affected marine mammal species or stocks.

Unmitigable Adverse Impact Analysis and Determination

In order to issue an IHA, NMFS must find that the specified activity will not have an "unmitigable adverse impact" on the subsistence uses of the affected marine mammal species or stocks by Alaskan Natives. NMFS has defined "unmitigable adverse impact" in 50 CFR 216.103 as an impact resulting from the specified activity: (1) That is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by: (i) Causing the marine mammals to abandon or avoid hunting areas; (ii) Directly displacing subsistence users; or (iii) Placing physical barriers between the marine mammals and the subsistence hunters; and (2) That cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

Subsistence hunting is important for many Alaska Native communities. A study of the North Slope villages of Nuiqsut, Kaktovik, and Utqiaġvik (formally Barrow) identified the primary resources used for subsistence and the locations for harvest (Stephen R. Braund & Associates, 2010), including terrestrial mammals (caribou, moose, wolf, and wolverine), birds (geese and eider), fish (Arctic cisco, Arctic char/Dolly Varden trout, and broad whitefish), and marine mammals (bowhead whale, ringed seal, bearded seal, and walrus). Ringed seals and beluga whales are likely located within the project area during this proposed action, yet the proposed action would not remove individuals from the population nor behaviorally disturb them in a manner that would affect their behavior more than 100km farther inshore where subsistence hunting occurs.. The permitted sources would be placed far outside of the range for subsistence hunting. The closest active acoustic source (fixed or drifting) within the proposed project site that is likely to cause Level B take is approximately 110 nm (204 km) from land. This ensures a significant standoff distance from any subsistence hunting area. The closest distance to subsistence hunting (70 nm, or 130 km) is well the largest distance from the sound sources in use at which behavioral harassment would be expected to occur (20 km) described above. Furthermore, there is no reason to believe that any behavioral disturbance of beluga whales or ringed seals that occurs far offshore (we do not anticipate any Level A harassment) would affect their subsequent behavior in a manner that would interfere with subsistence uses should those animals later interact with hunters.

In addition, ONR has been communicating with the Native communities about the proposed action. The ONR chief scientist for AMOS gave a virtual briefing on ONR research planned for 2022-2023 Alaska Eskimo Whaling Commission (AEWC) meeting in February 2022. This briefing communicated the lack of effect on subsistence hunting due to the distance of the sources from hunting areas. ONR scientists also attend Arctic Waterways Safety Committee (AWSC) and AEWC meetings regularly to discuss past, present, and future ARA. While no take is anticipated to result during transit, points of contact for at-sea communication will also be established between ship captains and whalers to avoid any conflict of ship transit with hunting activity.

Based on the description of the specified activity, distance of the study area from subsistence hunting grounds, the measures described to minimize adverse effects on the availability of marine mammals for subsistence purposes, and the proposed mitigation and monitoring measures, NMFS has preliminarily determined that there will not be an unmitigable adverse impact on subsistence uses from ONR's proposed activities.

Peer Review of the Monitoring Plan - The MMPA requires that monitoring plans be independently peer reviewed where the proposed activity may affect the availability of a species or stock for taking for subsistence uses (16 U.S.C. 1371(a)(5)(D)(ii)(III)). Given the factors discussed above, NMFS has also determined that the activity is not likely to affect the availability of any marine mammal species or stock for taking for subsistence uses, and therefore, peer review of the monitoring plan is not warranted for this project.

Endangered Species Act

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq*.) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally whenever we propose to authorize take for endangered or threatened species, in this case with Alaska Regional Office (AKR).

NMFS is proposing to authorize take of ringed seals, which are listed under the ESA. The Permits and Conservation Division has requested initiation of section 7 consultation with the AKR for the issuance of this IHA. NMFS will conclude the ESA consultation prior to reaching a determination regarding the proposed issuance of the authorization.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to ONR for conducting their fifth year of ARA in the Beaufort and eastern Chukchi Seas from September 2022- September 2023, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. A draft of the proposed IHA can be found at: *www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act*.

Request for Public Comments

We request comment on our analyses, the proposed authorization, and any other aspect of this notice of proposed IHA for the proposed ARA. We also request comment on the potential renewal of this proposed IHA as described in the paragraph below.

Please include with your comments any supporting data or literature citations to help inform decisions on the request for this IHA or a subsequent renewal IHA.

On a case-by-case basis, NMFS may issue a one-time, one-year renewal IHA following notice to the public providing an additional 15 days for public comments when (1) up to another year of identical or nearly identical activities as described in the **Description of Proposed Activities** section of this notice is planned or (2) the activities as described in the **Description of Proposed Activities** section of this notice would not be completed by the time the IHA expires and a renewal would allow for completion of the activities beyond that described in the *Dates and Duration* section of this notice, provided all of the following conditions are met:

- A request for renewal is received no later than 60 days prior to the needed renewal IHA effective date (recognizing that the renewal IHA expiration date cannot extend beyond one year from expiration of the initial IHA).

- The request for renewal must include the following:

(1) An explanation that the activities to be conducted under the requested renewal IHA are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor (*e.g.*, reduction in pile size) that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take).

(2) A preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

Upon review of the request for renewal, the status of the affected species or stocks, and any other pertinent information, NMFS determines that there are no more than minor changes in the activities, the mitigation and monitoring measures will remain the same and appropriate, and the findings in the initial IHA remain valid.

Dated: July 20, 2022.

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[FR Doc. 2022-15937 Filed: 7/25/2022 8:45 am; Publication Date: 7/26/2022]